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THE ANCIENT KINGDOM OF KONGO *: ITS PRESENT POSITION AND POSSIBILITIES. †

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It is a matter of genuine regret that a subject so full of interest and importance is not in the hands of a man who can do it justice, and bring with him more experience and authority in matters geographical than I possess. It has been my privilege to labour in Africa under the auspices of the Baptist Missionary Society for nineteen years, fifteen of which have been spent in Portuguese Congo, and for the most part at San Salvador.

My journeys in Kongo and Zomboland have been made wholly with a view of facilitating and extending the work of our society, and of studying the customs and habits of the people. But whatever qualifications I lack as a geographer, I claim to be a sincere devotee of the science, and an enthusiast in the work of opening up the Dark Continent to the light and blessing of civilization.

It is a remarkable fact that the northern portion of the province of Angola is the least known of all the districts in this part of Africa, notwithstanding its proximity to the sea-coast, and its being the first discovered by the early Portuguese travellers, and the country covered by the ancient kingdom of Kongo. We owe the very name of "Congo" to this old kingdom, for according to native usage the name applies only to the district around San Salvador, the native name for which is "Ekongo," and the natives know no other. The Congo river is generally called Nzadi, or Nzari, which means "the river," and is corrupted

* The form "Kongo" is adopted in this paper when it applies to the Ancient Kingdom, from which the name is derived, and "Congo" in its modern use as referring to the river or State territory.

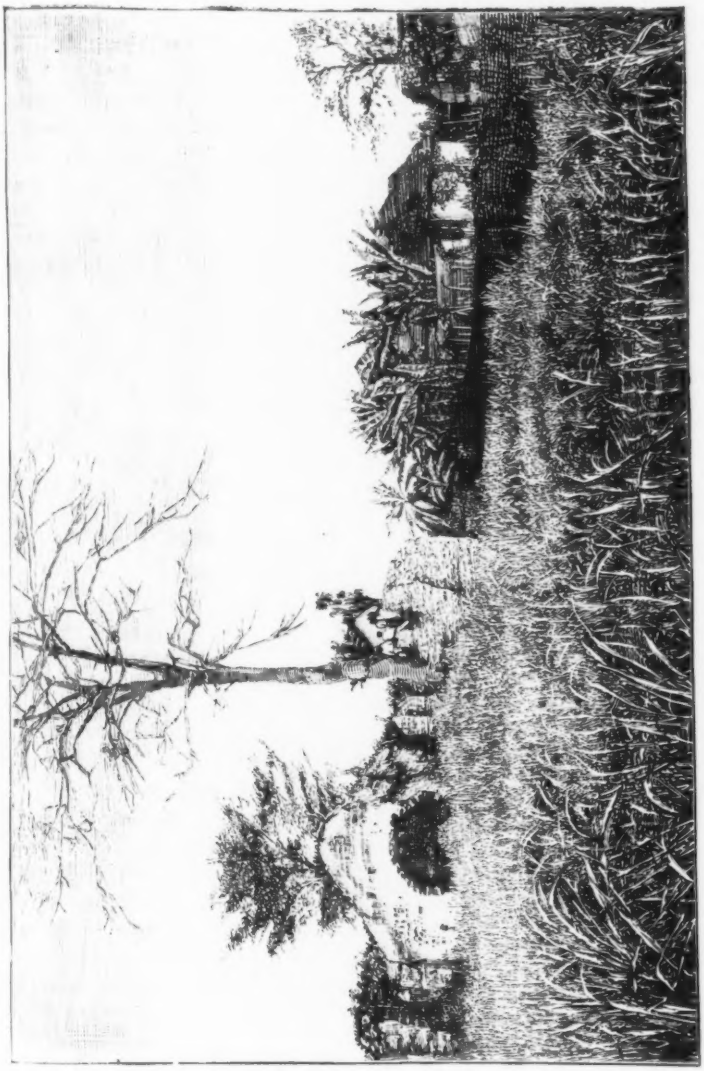
† Map, p. 668.

by the Portuguese into Zaire, but when the people wish to distinguish it from other rivers, it is called Mwanza. Owing, perhaps, to the prominence given to the Kongo kings and court in the records of the Portuguese navigators and explorers of those days, the name has been applied in modern times not only to the ancient Kongo country, but to the Mwanza river, and to the vast region on both its banks reaching right away to the furthest limits of the Congo State. But while those vast regions are being rapidly opened up to the influx of commerce and civilization, this land, so rich in history and interest, has been passed by and to a great extent forgotten. What is known to-day of the ancient provinces of the kingdom of Kongo—Sonyo, Mbembe, Mbamba, Nsundi, Mpangu, and Mbata? Even Sonyo, situated nearest to the coast towards the mouth of the river, is practically a *terra incognita* to-day. Very little is known of this northern district lying between the river Congo and the Kwangu; even the delimitation of the boundary between the State and Portuguese territory has not yet been carried out.

We first became acquainted with this marvellous country in the story of the voyages of Diogo Cam, who, on reaching the mouth of the river in the year 1482, learnt from the natives who boarded his vessel that "far in the interior there lived a powerful king." He thereupon despatched to this king "some Christian negroes as his ambassadors," to assure him of the friendly intentions of his visitors from Portugal, and of their desire to trade. Thus was effected the first discovery of a wonderful people and a powerful African monarch.

Battell, Duarte Lopez, Cavazzi, and others have left us truly wonderful descriptions of the kingdoms of Kongo and Angola as they were, or supposed to be, in the fifteenth and sixteenth centuries. And, making due allowance for a vivid imagination in matters of detail, we are compelled to recognize the royal service which these early travellers rendered to the cause of what may be termed "unscientific geography." In those palmy days of the Spanish and Portuguese nations, there is no doubt but that a certain amount of civilization was introduced into the country. The whites who were sent out from Portugal established themselves at several points on the south bank of the river, and with commendable skill and perseverance built houses, fortresses, and churches, the ruins of which are still to be seen at Sonyo near the mouth, at Mbembe in the interior behind Ambrizette, and notably at San Salvador, the capital of the ancient kingdom. This last is beyond doubt the most important, and is full of historical interest. We read of a mighty monarch who ruled over a vast region, with a host of princes governing dependent provinces. The pomp and glory of this brilliant court are startling in the extreme, and one gasps for breath at reading of the rapidity with which the king and nobles of a hitherto heathen and pagan country put on the garb of our European civilization and espoused the Christian religion. For in the year 1491 many priests arrived from

Europe, and very soon three churches were built—one dedicated to the Saviour, whence the city derived the name of San Salvador; the second



RUINS OF ANCIENT CHURCH, SAN SALVADOR.

and third were dedicated to the Virgin Mary and St. James, in recognition of their miraculous intervention on behalf of the people at a critical

point in one of their battles. These were not, however, the first, for a church was erected when the first Christian king, Don Joaõ, made a vow of fidelity to God, and planted a large wooden cross in an open space in the town as a witness; afterwards he commanded that a church be erected on the spot, to be called the Church of the Holy Cross. In all eleven churches are spoken of as having been built here, but it is almost certain that they did not co-exist. Old buildings were destroyed and rebuilt; these were rededicated to some other saint according to the tastes of the priests there at the time, and hence the confusion. We are assured, for example, that one night the devil came and carried away the roof of the church of Santa Cruz, and the Yakkas from the Kwangu, who seem to have been in league with his majesty of the lower regions, followed hard after, and completed the destruction of both church and city.

When the Kongos, after a short period, reoccupied their capital with the help of Portuguese traders and priests, they directed their attention to the fortification of the city, and surrounded it with massive stone walls. They also constructed inner walls around the king's palace and the dwellings of the nobles; also one surrounding the European quarters. Pigafetta speaks of these walls, and his description of them is one of the few things that can be relied on in his highly embellished book of romances.

There may arise at some future time some sceptical and unbelieving spirits, who, unable to discover any traces of these walls, will ridicule the idea that they ever existed. The Government authorities and the Roman Catholic Mission at San Salvador have no veneration for these relics of a glorious past. The city walls have been demolished, and the stones from the foundations have been requisitioned for modern Government buildings. Our own mission has assisted in these acts of vandalism; but we protected the last piece of stone wall near the cathedral ruins —probably a portion of the monastery where the priests dwelt—until it became dangerous to life. Three years ago we were reluctantly compelled to pull it down, and the stones were used to erect a modern church large enough to accommodate 900 worshippers. About the same time the priests and Government officials made a futile attempt to restore the old cathedral. They pulled down the walls of the main building, and the side chapel dedicated to "Our Lady," with the intention of erecting a practically new church, but preserving the main arch of the chancel and the eastern end which contained the old and massive stone altar. They carried the walls up nearly to the square, when suddenly the whole structure collapsed. It was not the devil this time, but a heavy storm during the night, which caused the fall. The new building was not laid on the original foundations, and a rotten foundation on the graves of generations of African royalty was not sufficiently strong to bear the weight of a modern church. This

accounts for the present condition of these once picturesque ruins, and it must be confessed that they have lost the greater part of their interest to us. The arch, however, is still left us, standing firmly among the *débris*, and is about the only thing left to mark the civilization of three centuries ago.

The massive walls and churches were built of the ironstone so plentiful on the plateau on which San Salvador is situated. Some huge blocks of this stone were used in the foundations and for the doorways and arches of the churches. The walls had thin layers of limestones used as "headers" to bind them together. Very excellent mortar was

LAST PIECE OF THE CONVENT WALL, SAN SALVADOR.

made, and an abundant supply of limestone was obtained from the quarries a few miles away. The amount of labour represented by these ruins must have been enormous, but we must remember that the work was done in "the golden days of slavery," and Kongo at that time was the great centre of the trade. The population of the capital then is given at 100,000; to-day it does not exceed 1500.

Time changes everything, and to those of us who have laboured so much in trying to find good building-stone wherewith to build our houses, it is most tantalizing to read the fine description of the rocks of San Salvador given by Pigafetta. He says—

"The mountains of Congo furnish quarries of various valuable stones, from which might be cut columns, architraves, bases, and other

large blocks, for building anything that was required. Indeed, it is said some masses are of such enormous size, that a whole church might be cut out of a single piece of the stone, like that which forms the obelisk now standing before la Porta del Popolo. Besides these, there are the mountains producing porphyry, jasper, and white and coloured marbles, which in Rome are known as Numidian, African, and Ethiopian marbles, some columns of which are in the Gregorian Chapel. Other marbles are found here, and amongst them very fine ones inlaid with jacinths, which are gems, and form veins on the mother stones, and these, when separated and arranged in small pieces, can be formed so as to look like pomegranates. Columns, obelisks, and such-like works of art can be made from this marble, which sparkles as if studded with beautiful jewels."

Alas for the deterioration of the ages! As if it were not enough to rob us of the pomp and pageantry of a mighty African kingdom with its magnificent civilization and religion, we are left to wonder what has become of these mountains so marvellously rich in beautiful and precious stones. Pity they did not use this Numidian or Ethiopian marble in the construction of their churches—or at least in that of the church altars—instead of using the common ironstone. The fact is, these mountains of porphyry, jasper, and marble are purely the product of unbridled imagination.

It is impossible, with materials at our command, to say how long this city was occupied by the Portuguese. When the "trade" was firmly established, and the kings and nobles of Kongo became the active agents of the white traders and faithful vassals of the King of Portugal, the European residents could withdraw to the coast at Loanda and Ambrizette, paying yearly visits during the dry seasons to San Salvador to conduct to the coast the accumulated gangs of slaves. Sometimes, however, the gangs were entrusted to the care of a reliable native. I knew well two old men who went repeatedly for this purpose to Loanda. They counted on three months for the return journey, and many gruesome tales they had to relate. They thought that they were in the service of Nemputu, the King of Portugal! The companies of slaves were generally accompanied by one or more priests, who received slaves from the natives in return for baptizing their children and administering spiritual consolation to the nobles of the land. These gangs of chained slaves, moving ponderously along on their way to the coast, have left behind them indelible marks; and their tracks are easily recognized by the names of towns and villages where they halted or encamped for the night. Such names are "Vunda," meaning "rest," where the midday halt was made, and "Vemadia," a corruption of "Ave Maria," where the priests and their newly made converts in bond chanted their vespers and rested for the night. Kinganga, again, is a name of a "town of the priests," and

the inhabitants of these towns consider themselves to this day the property of the Nganga, or the Catholic priest.

We have all through Kongo and Zombo a distinct connection with the past in the Santu or Christian names which every man and woman indiscriminately adopts in addition to the usual native name. The early priests gave their converts Christian names, and the titles Don and Donna were prefixed to the names of the king, queen, and princes. This established a custom which delighted the heart of every savage, and now every child that is born in the land is dubbed Don or Donna something; and it would be a most interesting psychological problem to demonstrate the power by which such empty and self-assumed titles

"IVORY" ROCKS NEAR SAN SALVADOR.

and names can fill a savage race to such a degree of unspeakable pride and personal vanity. It is considered a serious breach of etiquette and a personal insult to address anybody without first mentioning his Santu name, and elaborately calling him Don so-and-so.

The crucifix is another relic of the early missionaries, and is to be found often among the many fetishes of native chiefs. These are generally made of a brass figure fixed to an ebony cross, and in the Kongo district they are looked upon as charms. The Christian symbol or meaning is entirely lost, and they are besmeared with the sacrificial blood of animals at the hands of the witch-doctors in the same manner as all their other charms. In Zombo, however, the crucifix is a symbol of power passed down from one chief to his successor. This custom is general. Sometimes it is a sceptre, as in the case of the kings of Kongo, sometimes a sword, a knife or any trinket. The only crucifix

I have seen in Zombo belongs to a chief who rejoices in the name of Nkila-nkosi (the Lion's tail), whom I found one day sitting outside his hut polishing it with a piece of cloth and ashes. I was at once deeply interested, and he conversed freely with me about it, but it had no supernatural significance to him, and it was only a symbol of his chieftainship. He waxed eloquent at my asking him what would happen if it was lost or stolen from him, and he assured me that he would wage war with any offending clan who attempted such a thing. And he meant it.

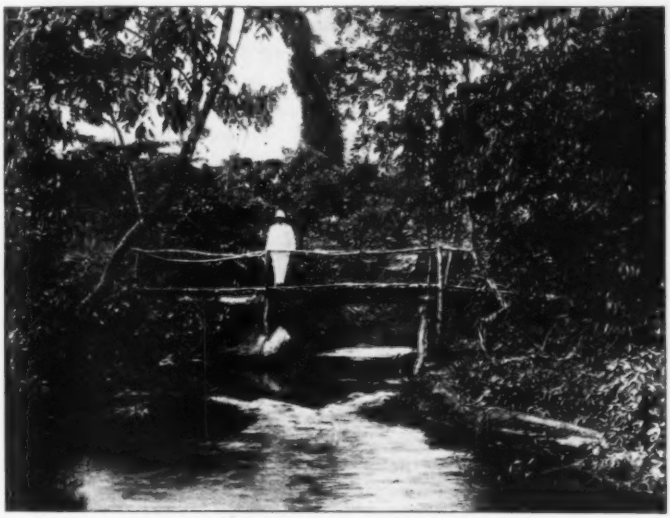
No doubt the crucifix is the origin of the multitudinous crosses that are met with at every point. Nearly everybody has one among his fetishes, and sometimes they are elaborately carved. The traveller also sees arranged on the walls of houses of chiefs little crosses made of folded palm leaves. These represent presents of palm-wine made by visitors, and in accordance with strict etiquette, a leafy cross is inserted at the side of the stopper of each calabash or demijohn as a sign of respect to the recipient. He in turn displays these loving tokens on the walls of his hut to let passers-by know what an important man he is. And there is often a keen competition among rival chiefs as to who can display the greatest number. So it has come to pass that the most holy of symbols can be degraded to one of petty jealousies and debauchery.

Speaking of crosses, it is interesting to note that at the Kibokolo market-place, in the Zombo country, there is a huge wooden cross erected, as I have been told, to commemorate a treaty of peace made between the different clans of the district when they agreed to make this their common market, and their cause a common cause. Hence, the mere existence of wooden crosses does not necessarily mean that they mark the site of ancient Catholic missions.

To bring our story down to modern times, it is necessary to say that the kingdom many times in its history had to pass through trying and turbulent seasons, and there were occasions when the succession to the throne was not an easy matter to settle. The practice of polygamy does not simplify questions of royal succession, and there are always those conflicting claims of various clans and families who are ever ready to fight for the imaginary glory of such an exalted position as is only offered by a royal throne in the wilds of Africa.

One of these occasions occurred about fifty years ago, when three important clans gathered their forces in the neighbourhood of San Salvador, each claiming the right of succession. There was considerable fighting, and trade was impossible. The Portuguese despatched a force into the interior to quell the disturbance. They espoused the cause of the Kivuzi family, but not until there was much bloodshed did they succeed in placing Don Pedro on the coveted throne. Mbumba, one of the rival claimants, was appointed to the nominal position of

prince, and the title of "Nosso Principe" was conferred upon him. The third refused to acknowledge the new rule, and until his death, three years ago, he declined to pay homage to the King of Kongo. He hated the Portuguese with a perfect hatred. During the war a Portuguese officer fell into his hands, and Kiamvu carried away the head in triumph to his town, only a few miles away across the river Luezi. He cut out his heart, which he triumphantly ate at a great feast in honour of the occasion, while he drank his palm-wine out of the cranium of his victim's skull. This spectral vessel was constantly brought out on special occasions for his drinking-cup when he wished to display his prowess in war and his hatred of the Portuguese. Since



LUSENGELE STREAM, KIBOKOLO.

his death this relic has come to the hand of Senhor Faria Leal, the present Resident at San Salvador.

During this short occupation the Portuguese built a fortress covering a little under an acre of ground on a projecting point on the eastern end of the plateau. This stands to-day, but is of no special interest to us.

Such is the past record of a kingdom which has now been reduced to all but an empty name, for the present king of Kongo is nothing more than an ordinary native chief, with very limited powers, even over his own people. Nevertheless, he is endowed with a remarkable amount of self-importance and conceit, imagining himself of more consequence than the Tsar of all the Russias, and having an equal only in the King of Portugal.

The district of Kongo, as this northern portion of the province of Angola is officially known, varies considerably in different parts in respect of soil, climate, and scenery. A distant view from the deck of an ocean steamer as we enter the mouth of the river affords a most pleasing effect of a combination of graceful palms and tropical verdure, and the eye catches with delight a glimpse of the green grass which clothes the distant hills; but as we steam up the river close to the banks of the swampy islands, and watch the muddy water oozing out from among the peculiarly formed roots of the mangroves, one's enthusiasm for the beautiful is very considerably modified. When about 60 miles from the mouth, we reach Boma—the capital of the Congo State—on the north bank, where there is quite a settlement of Europeans of all nations, but principally Belgian officers of the State. The mangrove swamps are now left behind, and the river becomes narrower, with rugged barren hills on both sides. We have lost the thick tropical foliage, but it is decidedly picturesque (from the deck of a steamer). When Noki or Matadi is reached, and we make the acquaintance of real African life, it is then that we realize what the Kongo country and the climate can be. Many a new-comer has watched the departure of the steamer in which he sailed for this inhospitable land, with a bitter tear and an aching heart, and often saw it for the last time. Noki and Matadi, in close proximity to each other, are perhaps the most deadly places on the Congo. The heat is great, and the bare rocky surface of the soil around the dwellings reflects the rays of the sun so that sometimes it is unbearable. The sanitation, or rather the absence of it, is a disgrace to any nation, and happy is the man whose lot it is to proceed inland and dwell on the highlands of the interior. We who go into Portuguese territory climb up the famous Noki hill, the ruggedness of which did not seem half so formidable from the steamer as it is in reality; but once on the top, about 900 feet above the sea, we breathe more freely. We proceed on our journey, at first dodging around boulders of rocks and passing over rough road, but as we advance further away from the river the soil becomes richer and the roads better. For the first three days we meet with hardly any native villages, and there is very little cultivation of the ground; but after the third day we come to the rich valleys of the Mpozo and Luzo; then we cross the Lunda and lesser streams, all running into the Mpozo. In the productive soil of these valleys the grass grows very high—about 15 feet in some places—and it is with great difficulty we make our way through it. Nearing San Salvador, which is reached about the sixth day, the country becomes more hilly, and about three and a half hours before we reach the capital we pass the Mpungi, or Ivory rocks, so called by the natives on account of their peculiar peaky appearance. There are many superstitions about these rocks, which cannot be noticed in this paper.

At San Salvador we are 1840 feet above sea-level. The town is very much like any other African village, situated on the top of a hill, with the river Luezi winding at the foot from the east to the south. Here we have come within the limits of the accompanying route-map, and I need not enter into much detail about the country. Leaving San Salvador in an easterly direction, we pass over an undulating country, and after travelling about 50 miles we reach the foot of the plateau. The ascent is very steep and rugged, and the scenery grand. Close by are the Mbrizi falls, well known to geographers; but there are, not many miles to the south, two other falls, to all appearance equal in volume to those at Kizulu, and the waters of both falling into the Mbrizi in the valley. Travelling along this plateau, we pass the source of the Mbrizi river, and not far away is the highest point I have registered, viz. 3400 feet above the sea. Further on this plateau is abruptly broken by the Lufunde valley, on both sides of which are deep chasms and precipitous rocks, and the sparkling waterfalls are a delightful change to the weary traveller after the monotony of the journey. The valley is very fertile and well cultivated, but there are many swamps and morasses, which are here utilized for an extensive eel fishery. They are caught by means of small bottle-shaped basket traps made of split bamboo. The fish are arranged on a spit about a yard long, and then smoked over a fire, and thus preserved they are ready for the markets. The catfish (*nyola*), which abounds in the rivers, is treated in the same manner.

Having crossed the Lufunde, we ascend once more to the plateau where, three years ago (in 1899), our society established a new mission station at Kibokolo, which I hope to call my home for some years to come, and make it a centre from which to make journeys into the unexplored regions to south and east. Continuing our journey eastwards on the plateau, we come to the Nkissi river, which is known here as Nzadi a Malewa. The Malewa valley is extremely swampy, and the river constantly overflows its banks during the rainy season, rendering it dangerous to cross in the roughly hewn native canoes which ply for hire at the various ferries. The river is infested with crocodiles, but there is some fishing and a large quantity of edible shellfish, in appearance like periwinkles, but much larger. This is the furthest point east that we have touched, and I found that the dialect spoken in this district differed somewhat from the Kongo language, although we could easily understand each other.

The principal point of interest to the geographer in this sketch-map of the Zombo highlands is the number of river sources it shows. Zombo, in a most literal sense, is a land of water and streams, clear as crystal; sometimes rippling through shady glens and pebbly watercourses, then dashing down a ravine and over the precipitous rocks into the valley beneath. Within this small area we have the sources of the well-known

rivers of Luvu, Kwilu, Fulezi, Luango, all running north towards the Congo; while the Mbrizi, Pasasa, and Lufunde flow to the south, joining, however, before they empty themselves into the Atlantic. Thus the Zombo country forms the watershed of the Congo-Mbrizi basin.

The greatest part of the country is covered by the common African grass, which, however, is shorter and less coarse on the highlands, and is burnt by the natives in the dry season of every year. The woodland is practically confined to river-banks and ravines, with patches around the towns and villages. Good timber for building purposes is limited. There are one or two excellent trees, notably the nkamba, or African mahogany, and nlongwa, a good working wood, of which there is a fair supply in most districts. The baobab is met with everywhere, but is practically useless.

The soil is good and produces a variety of things. In Kongo the women do all the farm work, but in Zombo the men are more industrious, and do a fair share of the farm labour. The tillage is of the simplest and the implements primitive. The hoe is the only implement used, with a cutlass to clear away the brushwood if necessary. They work a piece of land for a year or two, and get out of it an average of three crops a year; then they allow it to lie fallow until they take a fancy to return to it. There are no land laws, and consequently no landlordism—a model place for a certain class of politicians—and the first person to select a plot of ground and mark it with his hoe, occupies it as long as he uses it. No rent or taxes are demanded. The African grows his food cheaply and easily, for the labour of scratching the surface of the soil with a hoe is very light. The principal native products are the manioc or cassava, yams, sweet potato, maize, millet, and various kinds of beans and pumpkins; the seeds of the latter are considered a delicacy, and take the place of meat to a great degree. These, with the plantain and banana, are the principal foodstuffs of the Kongos and Zombos.

The natives are not heavy meat-eaters. The domestic fowl—that marvellous combination of skin, bones, and feathers—the old friend of all African travellers, and the inevitable bleating goat, are common to all districts. There are also some sheep to be had. But the darling pet of a Kongo man is his pig. You can treat his wife and children as you like, but if you touch his pig, beware! To kill a man's pig that breaks through your fence and digs up your vegetable garden is to commit the unpardonable sin, and the owner never forgives you. Hog's flesh is equally dear to him. Game in some parts is plentiful, but more especially in Zombo. There we have several kinds of deer, antelopes, and wild hares; the only difficulty is to bag them. Guinea-fowls, partridges, and pigeons abound, and there are some pheasants; and in the swampy valleys we find wild ducks and many other birds. Eagles, vultures, and other birds of prey, are common, and very

annoying, while the woods are resplendent with the gorgeous plumage of the birds. Elephants, buffaloes, and leopards are to be found, but must be sought for in the more sparsely populated districts.

The climate of Zombo, compared with that of the Congo in general, is healthy. At Kibokolo, although for the past two or three years we have lived in a rough way in temporary grass houses, the health has been excellent. The same thing may be said of the Portuguese at Makela, who say that the climate is equal to that of Portugal, which is doubtful. It is too early yet to speak with any certainty on this subject, and time alone can decide it. But with an altitude of over 3000 feet, a sandy and well-drained soil, with an abundant supply of

A NATIVE SMITHY, CONGO.

excellent water, I see no reason why it should not be a fairly healthy climate. Certainly it is a great improvement on the swampy lowlands of the Congo valley. The mean maximum temperature is 84·6° in the shade, and the mean minimum 64·8°, thus giving an average daily range of twenty degrees. The rainfall last year was 55·5 inches, which, I believe, was below the average. The rainy season is from October to May. Reports recently received from Kibokolo announce very heavy rains in the month of September last.

We must here pass by the manners and customs of the people—the subject is too tempting a one to venture even on the fringe of it—but we must say a word in reference to the natural capacity and character of the people themselves.

The native is the principal factor in the development of any country, but especially is this the case in the tropics, where everything depends

on native labour. We cannot afford to neglect him; and no knowledge of the country is complete without a thorough understanding of the native as he is and as he can be. The mind of the savage is not a blank; and when one becomes familiar with his beliefs and superstitions, and the complicated nature of his laws and customs, preconceived notions of his simplicity of thought go to the winds. I have yet to find that most apocryphal of beings described as the "unsophisticated African." We laugh at and ridicule his fetishes and superstitions, but we fail to follow the succession of ideas and effort of mind which have created these things. After most careful observations extending over nineteen years, I have come to the conclusion that there is nothing in the customs and fetishes of the African which does not represent a definite course of reasoning. On my first journey into the Zombo country, in 1898, we came across at almost every point a peculiar arrangement in the form of a trap, which was set up at the entrance into villages and huts, and on inquiry I learnt that these were traps with which they endeavoured to catch the devil. Very ludicrous, certainly; but then I tried to imagine the gigantic feat of mental exercises which enabled them to think out a plan to secure so desirable an end. And can it be possible that the savage mind has gone a long way ahead of his civilized brother in making some attempt to capture the common enemy? The point which I wish to press is that the native is capable of thinking and reasoning, and therefore can be trained to take a prominent part in the development of his country.

Hitherto, both the country and its people have been sadly neglected. And I venture, at this critical time in the history of Africa, to put in a plea for a fuller recognition of the native element in dealing with African questions. You cannot manage Africa apart from the African, and the future destiny of this vast continent from the Cape to Cairo will depend in a large measure on how we deal with the natives. It is of the utmost importance that they should be trained and equipped to take their proper position in the triumphant march of progress and civilization. I view with the deepest concern and distrust the present fever-heat rush of civilization into the heart of Africa. It is not a natural growth, and it does not represent any real development of the native character. It is the quick growing fungus that rots the whole structure. It is the donning of a suit of ready-made clothes to cover the Ethiopian skin, and the wearer will not know how to mend or patch it. The imported article is very good for fiscal purposes, but, whether it be in commerce or in religion, we ought never to lose sight of the truth that a veneer of civilization is the worst possible thing for a savage people, and carries with it the seeds of all trouble, political and otherwise. Freedom without principle means anarchy and confusion. For this reason domestic slavery cannot be abolished by force. The progress of the country and the advancement of free institutions

depend wholly on the development of the character of its people, and this can only be effected by a long and patient course of training. And in this noble work Christian missions occupy a leading position.

From this point of view, it is not altogether a disadvantage that this country is in the hands of the least ambitious and self-assertive of European governments. The very weakness and poverty of the Portuguese has its advantages, for the small military force at their command makes them wary of entering upon mischievous punitive expeditions and thus devastating large tracts of country. About twenty native soldiers are sufficient for San Salvador, and at the military post of Makela the officer there has managed to keep the peace with three. I have great admiration for the tact and wisdom of any government which guards itself against the mistake of placing too many soldiers at the command of an inferior and inexperienced officer. Nevertheless, one would fain see a little more activity on the part of the Government in opening up the country, and it is a matter for congratulation that during the past few years some advance has been made. In the year 1887 an official resident settled at San Salvador, but commercially this old capital is of little importance, and the trade is very small. The trade routes and rubber markets are some distance away. While the Portuguese were vegetating on the coast and at San Salvador, the trade was being diverted across the borders into the Free State at Chiloango, Tumba Mani, and other points where the Belgians had prosperous trading stations. This constant deflection of trade from the Portuguese district had the effect of waking up the authorities to a sense of their duty, and in 1896 a fiscal station was established at Makela, near the borders. Seven or eight trading firms have their agents there at present. The competition between them is very keen, and it is doubtful whether the existence of so many conflicting interests are a blessing to the country in any sense. Three years later a third military post was established to guard the interest of the province at the extreme north-east corner on the Kwangu river, and it is expected that this will be effective in protecting trade.

A more important move, in my opinion, would be to protect the principal caravan routes from the interior to the coast stations. Often these routes are closed against all on account of native disputes and fightings. On such occasions unwary caravans are attacked and plundered of all their goods and produce. Even in time of peace, it is appalling the amount of blackmailing that goes on. The owner of a native caravan with rubber, going from Zombo to the coast, considers himself fortunate if he reaches the trading stations with half his rubber in his possession, and more fortunate still if he carries home with him the greater part of the goods he received for it. This blackmailing system is of such enormous dimensions that whole towns and districts practically live on their plunder of native caravans, and, as far as I

know, the Government has never attempted to cope with this most serious obstacle to trade and the development of the country. I am far from suggesting the misguided policy of despatching a force of native soldiers to burn towns and villages and clear the *routes* of all natives. This is no government, and whenever the policy has been followed it has been most disastrous. It is of the first importance that native carriers should be able to obtain food on the way as they go with their heavy burdens to the coast, for they cannot carry with them sufficient provision for their return journey. This fact partly accounts for the great difficulty experienced by traders and others in obtaining carriers for the transport of their merchandise. This transport problem is a very serious one, and the final solution of the difficulty will not be arrived at until railways have been constructed from the coast to the chief markets in the interior. Under the present system the Government official at Makela is practically a recruiting agent, running all over the country and demanding under threats and penalties so many carriers from native chiefs for the various trading houses.

But the most serious outlook for the future, however, is that the whole district, rich in fertile valleys and productive highlands, is lying idle, without any attempt to make use of it. The last report of H.M. Consul at Loanda is absolutely correct, when it says that "thousands of square miles of rich land are to be met with on the margins of the different rivers and in the higher lands in the interior awaiting the plough and harrow," but the Government gives no facilities or encouragement to bring these vast regions under cultivation. A school of agriculture and the establishment of a botanical garden would be a step in the direction of averting the total ruin which threatens the province. I do not know of a single commodity of commercial value which is produced in the Kongo and Zombo countries except what the natives consume themselves. A little coffee is grown in one or two places. The cultivation of rubber has almost, if not wholly, disappeared. What is brought to the markets to-day comes from a long distance away. The soil will grow almost everything. Coffee grows well; the tobacco-plant is a sight worth seeing in Zombo, and flourishes everywhere; sugar-cane thrives luxuriantly in the valleys and on the hills. In fact, with a little enterprise, I see no reason why other tropical and sub-tropical plants should not be introduced, with lasting advantage to the country.

Here we are confronted with the difficult problem of native labour, which is essential to success in an agricultural undertaking. But I venture to think that this is not so serious an obstacle as we are sometimes led to believe. The African native *can* work and *will* work when he is taught to take an interest in it, as can be shown by the fact that the large church completed three years ago by our mission at San Salvador was built *entirely* by the young men trained by myself, and

paid for by the natives themselves. The difficulty in the case of a savage is that his needs are so few that there are really no inducements for him to work; and as long as he is satisfied with bare animal existence, simply to eat and to drink and wear no clothing, there is no earthly reason why he should do any work. The obvious remedy to all this is to create new needs by educating him to take a wider view of life and holding before him higher ideals. It is an immense advantage even to trade to tell a man that he ought to support his wife and children in a respectable manner, to build a decent house to shelter them, and to clothe them modestly as human beings, instead of depending on his wives for the food which he eats. He will then have to rouse himself from his sloth and inactivity, and apply himself diligently to some remunerative occupation, which will be the making of himself and the salvation of his country.

In closing, I would say that the future of this ancient kingdom of Kongo does not depend on the discovery of gold or copper mines within its borders, but on the more important discovery of the native himself—the discovery of all that is best in him and all that is noble. For generations he has been looked upon as "a slave," "a piece," and "a hand," but not until the *man* in him is found and recognized can there be any real progress made in the development of Africa.

APPENDIX.

Meteorology.—The following is an abstract of thirteen months' meteorological observations made by the Rev. Thomas Lewis at Comber station, Kibokolo, in the Zombo country (6° 16′ S., 15° 17′ E., 3100 feet). The instruments in use were a self-registering rain-gauge by Crosley, and a combined maximum and minimum thermometer by Hughes & Sons.

Month.	Temperature.					Rainfall.		
	Mean max.	Mean min.	Mean 9 a.m.	Extremes. Highest.	Extremes. Lowest.	Inches.	No. of days.	Highest in 24 hours.
1899.	°	°	°	°	°			
November	83·5	65·8	71·9	91	63	9·26	16	3·12
December	84·2	65·9	73·4	93	61	7·25	11	1·91
1900.								
January	83·5	66·7	70·8	92	65	7·16	9	1·62
February	86·2	67·4	71·1	93	66	6·98	5	2·44
March	86·5	66·7	73·2	98	63	5·06	9	2·70
April	86·0	66·8	72·5	93	63	12·22	13	3·35
May	88·3	66·6	73·0	98	63	5·66	9	1·35
June	84·4	61·0	66·5	97	55	0·00	—	—
July	79·9	57·6	62·0	92	54	0·00	—	—
August	81·2	57·9	63·3	89	53	0·00	—	—
September	83·7	62·1	67·6	93	56	0·81	3	0·45
October	85·6	65·5	71·4	95	62	8·19	9	2·07
November	84·9	65·8	72·7	91	63	5·00	12	1·28
Means or totals * ...	84·6	64·8	69·8	—	—	58·33	80	—

* December, 1899, to November, 1900.

The first rain in 1900 fell on September 15. June to August were rainless. There are two rainy seasons, as at San Salvador, with maxima in April and in October or November. Heavy hail fell in the afternoon of December 29. Many of the hailstones were over half an inch in diameter, and the ground was white.

Mr. Lewis's Map.—The map accompanying this paper is based upon the Rev. Thomas Lewis's itinerary surveys, checked by latitude observations at eleven stations. The longitudes are dependent upon the Rev. Geo. Grenfell's careful determination of the position of San Salvador, viz. 6° 15′ 45″ S., 14° 17′ 30″ E. These results differ very considerably from the results claimed to have been obtained by Dr. Chavanne, viz. San Salvador, 6° 20′ 28″ S., 14° 47′ 3″ E.; and Kizulu village, 6° 17′ 19″ S., 15° 18′ 54″ E. ('Reisen und Forschungen im alten und neuen Kongostaate,' Jena, 1887, p. 455). Information furnished by former explorers of the country has been inserted in skeleton letters.—E.G.R.

Before the reading of the paper, the Chairman (Mr. G. S. Mackenzie, Vice-President) said: I regret to say that through indisposition your President is unable to be present to-night to fill the chair, and I am called upon to do so in his absence. I have much pleasure in introducing to you the Rev. Mr. Thomas Lewis, who has spent twenty years of his life on the West Coast of Africa, and will to-night read to you a paper on "The Ancient Kingdom of Kongo: its Present Position and Possibilities." We are indebted to the African missionary, not only for his work in educating and civilizing the native, but also for the many important geographical explorations made by him. In connection with the latter, I have only to mention the names of Livingstone, Moffat, Hannington, Mackay, and many others too numerous to enumerate, to ensure our giving Mr. Lewis, as a member of the missionary body, a most hearty welcome here to-night. I will now ask Mr. Lewis to read his paper.

After the reading of the paper, the following discussion took place:—

The Chairman: We have a letter of regret from Sir Henry Stanley, saying that he is unable to be here to-night. He made an effort to get off a previous engagement, but was unable to do so. Sir Harry Johnston wrote also to say he had an engagement, but, if possible, would look in.

Mr. E. G. Ravenstein: I am a very poor substitute for either Sir Henry Stanley or Sir Harry Johnston, but I will, nevertheless, offer a few remarks. I think you will all agree with me that we are very much indebted to the Rev. Mr. Lewis. It is not the first time that the Society has been indebted to a missionary of the Baptist Missionary Society. Mr. Grenfell before this has achieved distinction as an African explorer, and, though a missionary, has done geographical work which, I believe, exceeds in value the work done by many men who claim to have gone into Africa as African explorers. Mr. Lewis has spoken wisely and discreetly of the needs of Africa. It is wonderful to think that the ancient kingdom of Kongo, which was supposed to be a glorious kingdom in the days when the Portuguese first became acquainted with it, should have sunk so low, notwithstanding the influence of civilization. But this is not what I should like to speak about to-night; I rather wish to draw attention to the great value of the geographical work done by Mr. Lewis. He is quite right in deploring that this kingdom of Kongo, with its history of 400 years—a very long history for an African kingdom—should not be better known in these days. The Portuguese knew it in their early days, and so did the missionaries, but their accounts were so vague that we utterly failed to

reduce their views to anything like a correct map. And as to other facts, I am afraid we shall have to take, and we have taken, all they have said about the history of this State, and of their own achievements as missionaries, with a grain of salt. Anyhow, I do hope a better time may come; and certainly so far as geographical exploration and a careful mapping of the country are concerned, that time has come with the advance of our missionaries and explorers. The country to the east of San Salvador in ancient days was frequented by Portuguese slave-traders and missionaries, who were also slave-traders, but even at the present time we know very little about it. It has been crossed recently by two or three German explorers, but their work is of very inferior value. I believe now for the first time we get some accurate geographical information through Mr. Lewis's work. He determined latitudes and made careful route surveys, but probably not as careful as he will do next time, after he has passed through the hands of our very competent instructor, Mr. McCarthy. We are thankful for favours past, but we look forward to favours to come. Very important is the careful determination of the position of San Salvador. It is really remarkable that a town of historical interest for 400 years past should have been placed hitherto 30 or 40 miles out of its true position. Mr. Grenfell, by careful observations, aided by Mr. Lewis, has now placed it in its proper position, and it is now a point from which we can start survey work. I hope these Baptist missionaries will not neglect geographical work. I really do believe that geographical and meteorological work would considerably aid them in their more professional duties as missionaries, and I do hope that some of the £500,000 which Mr. Arthington has left to the Missionary Society will be employed in forwarding geographical work.

Dr. Arthur Haydon: Mr. Lewis just now drew our attention to an albino, and I should like to ask him whether, in the course of his travels, he came across what you might call "white natives." I have seen in South Africa what are known as "White Kaffirs," who are not albinos. They have normal eyes and black woolly hair, and are in most points exactly like the ordinary black Kaffirs; but they differ in having a skin as white as an Anglo-Saxon. There appears to be no mixture with European blood to account for this. If Mr. Lewis could give us any information on that subject, I think it would be particularly interesting. Also I should like to ask whether there is any alteration in the physiognomy, whether the white native or the white Kaffir still retains the native physiognomy, or if it is in any way altered?

The Rev. Thomas Lewis: With regard to the question of the albino, in travelling all through the Zombo and the Congo country I have never come across any white natives; we have many brown and different colours, some more black than others, but nothing approaching white natives such as we hear of in South Africa. I have simply seen the albinos only.

The Chairman: I feel sure you will join with me in thanking Mr. Lewis for his interesting paper. My personal experience of the difficulties surrounding the opening up and civilizing of Africa enables me to appreciate Mr. Lewis's very pertinent remarks regarding slavery, a difficulty that cannot be ignored by the missionary or the explorer. Mr. Lewis very truly says, "Freedom without principle means anarchy and confusion; for this reason domestic slavery cannot be abolished by force." We all desire to see the slave trade promptly and vigorously stamped out, And if more gentlemen of Mr. Lewis's calling were to discriminate, as he evidently does, between "domestic" slavery and the "slave trade," it would not only lighten the burden of the administration under which the missionaries live, but it would tend to promote the noble work which they themselves have so much at heart. Unfortunately, many well-meaning and earnest men frustrate their own efforts by

provoking through misplaced zeal the natives to present a hostile attitude, which might be prevented by the tact and wisdom so evidently displayed by Mr. Lewis. It only remains for us to join in thanking Mr. Lewis for his very interesting paper, and I am sure I have your approval in doing so.

THE ARTESIAN WATER-SUPPLY OF AUSTRALIA FROM A GEOGRAPHICAL STANDPOINT.*

By W. GIBBONS COX, C.E.

In treating upon the artesian water existing in the crust of the Earth in Australia, and the changes, present and future, incidental to its utilization upon the surface, more particularly in neutralizing the effects of the droughts to which the country is subject, it will be necessary to consider, if only briefly, the evolution of the continent during the geological phases through which, according to the most recent scientific research (especially that of the late Queensland Government Geologist, Dr. J. L. Jack), it has passed.

A central sea still existed in Mesozoic times, and was then filled up to a large extent by sediments (in Cretaceous times). These were subsequently (in Tertiary times) uplifted, and formed with the Palæozoic rocks a united continent. Further depression again submerged part of the coastal and central land, and these depressions were followed by a re-elevation. The climate during these periods of depression was doubtless much more moist and equable than at present. Before the deposition of the Cretaceous sediments there were mountain chains on the eastern side of Australia, almost alpine in character, with which the ranges of the present time are insignificant in comparison. Those mountain chains induced great precipitation of the water held in suspension in the clouds by which they were, in all probability, constantly surrounded. Before the beginning of the Cretaceous period —of the deposit of the Cretaceous formation of thousands of feet in thickness, consisting of alluvial strata, including the artesian water-bearing rocks—the whole continent had subsided, but the strata lying above the Cretaceous, which has been proved in Queensland to be over 5000 feet in thickness, shows the great length of time which must have elapsed in the formation of the present surface, the great tablelands, or rolling downs, of the interior. Taking into consideration that during the Tertiary age there was a great deposit of rich alluvial soil from the decomposed material of the ranges, and also considering the climatic conditions prevailing, it is easy to imagine that the vegetation was of a most abundant and luxurious character, especially in the vicinity of the lakes, swamps, and inland rivers. Those conditions resulted in the development of a great variety of animal life, notably of an herbivorous

* Read at the Royal Geographical Society, January 29, 1902. Map, p. 668.

fauna of gigantic proportions, the fossil remains of which have been found in the Post-Pliocene strata in the Darling Downs of Queensland and in the interior of South Australia. Those remains marked, no doubt, the course of ancient rivers, or the position of ancient lakes. The changes in the physical conditions of the country which brought about the gradual extinction of the huge fauna can, I believe, be accounted for by natural forces. As the high mountain ranges became lowered, and the precipitation of torrential rain became thus reduced, when the river and lake sources of moisture had become destroyed, the climate underwent a gradual change. A condition of excessive moisture was followed by one of partial aridity; the long succulent, luxurious

"TRAVELLING" SHEEP TO WATER DURING A DROUGHT, QUEENSLAND.
(From a photograph in the collection of the Royal Colonial Institute.)

vegetation gave way to a shorter and less prolific growth, till finally aridity ruled to the extent it does in inducing the disastrous droughts of the present day. Those droughts are abnormal to the general condition of the country. During good seasons of fair rainfall, averaging on the great plains of the interior about 20 inches per annum, the indigenous grasses of the present day are of so highly nutritious a quality that animal stock of all kinds thrives in the most perfect manner—so much so that a pastoral, wool-growing, and cattle industry has been established which rivals in extent and importance that of any other country in the world. During the prolonged droughts which, however, occasionally set in, the condition of the interior undergoes a great and disastrous change. The water in the creeks and

lagoons has become exhausted by soakage—a great factor in results—and evaporation; the herbage has shrunk and lost its nutriment; the live stock is reduced to a precarious living by feeding on tree-growth, or to being "travelled" to, in many cases, far-distant localities, if such indeed be found free from the general aridity prevailing. The influence of these droughts upon man is physically and morally bad, especially in contemplating the present condition of the country to that ruling in the normally favourable seasons, and it is only by the exercise of indomitable will, self-denial, energy, and resource that the difficulties incidental to a prolonged drought are combated, and in a manner tided over.

It is evident that in order to combat these droughts, which are the result of a cessation of the normal rainfall, artificial irrigation must be resorted to. There are two sources of supply which may be drawn upon, *i.e.* that of rivers, and that from underground, principally in the form of artesian water. Irrigation from rivers has been largely availed of in various parts of the world. The great irrigation canals and systems of India are the most noted under British rule, and were made at an enormous cost by the Government of India. In Egypt extensive works have been and are being carried out by the Egyptian Government. In America—in California and Utah especially—irrigation has been adopted on a very large scale in connection with river-supplies, and it is, I think, very probable that equally intense culture exists in those states as in China, and certainly the art of irrigation has attained in the former a much higher standard. In Spain, Italy, and other parts of Europe, irrigation has been largely availed of, and also, to a limited extent, in South Africa and Australia, such as the Douglas irrigation, Vaal river, and others in the former, and Mildura and Renmark in the latter country. In all these works the source of supply has been flowing rivers, whereby a constant and ample flow is maintained through properly constructed channels and minor irrigation ditches.

For the purposes of irrigation—and this I wish to particularly emphasize—the rivers of Australia are, unfortunately, few in number. The one great river system, the Darling-Murray, which never runs dry, is limited to one section of country only; other flowing rivers consist of comparatively short courses emptying into the ocean at various parts of the coast, but the interior rivers and creeks—those of the great pastoral plains, although they carry great quantities of water in the "wet season" or during flood times, soon run dry during droughts, through quick soakage and evaporation. An effective conservation of the water held in these interior rivers and creeks during flood times by costly reservoirs and canals will be, I am afraid, beyond economic financial possibilities for a long time to come.

As I have intimated, there is, I believe, a remedy for this state of things—that is, in a fuller utilization of the artesian water which lies

conserved in the crust of the Earth, and which may be readily procured at a comparatively low cost.

Irrigation from underground supplies has long been practised, especially in India, Algeria, and America. In the Madras Presidency alone, according to official reports, the land irrigated from wells amounts to millions of acres, yielding a large revenue. It is a fair estimate that there are in Central Asia and Persia at least 200,000,000 persons depending solely for their food upon areas irrigated by water drawn in the most primitive manner from underground sources in the form of wells, springs, or drainage conduits. An examination of the records,

FLOODED COUNTRY, FROM AN ARTESIAN BORE.
(*From a photograph in the collection of the Royal Colonial Institute.*)

habits, and customs of the communities so supplied will show an exceptionally elaborate system of care and maintenance of the wells.

In Algeria, especially in the great Desert of Sahara, artesian water has achieved wonderful results. The transformation produced by artesian water upon the sandy wastes of Algeria as described by the distinguished French engineer, M. Tournel, is amazing. The most remarkable example of reclamation by means of artesian water is found in the desert provinces. The area officially given is 329,415 square miles, one-half of which belongs to the Sahara, or desert. The population, including 260,000 Europeans, is about 3,688,000. Cultivation by the means of flowing well-water has been sedulously fostered by the French Colonial Government for both political and economic reasons. Wells as a means

of reclamation were systematically commenced in 1857, the French engineer M. Jus having demonstrated in 1856 that the desert was endowed with large supplies of underground water. The total number bored since that date is nearly 15,000, and they are of moderate depth. The waters are collected in small ditches, which convey them to the vineyards, date trees, and fields of durra, millet, wheat, etc., which comprise the chief products. In all about 14,000,000 acres have been reclaimed in this way.

Irrigation by means of bored wells has nowhere attained greater practical or more favourable economic results than in America, of which country I can speak personally from an experience extending over some years. Artesian wells in the United States are reckoned by thousands, extending from Montana and North Dakota to the northern portions of Texas. Besides in the states of North and South Dakota, Wyoming, Nebraska, Colorado, Kansas, Idaho, California, New Mexico, and Texas, in which their numbers are almost incredible, in the northern and eastern states likewise an immense number of wells have been bored. Surely such a result as that, achieved by individual efforts in the utilization of underground water in so highly practical a community as that of the United States of America, speaks volumes as to the value of artesian water, and indicates the possibilities in that direction both in Australia and in those parts of the British Empire which have not had the benefit of the borer's drill.

The artesian rocks which contain that water form a part, as before stated, of the Cretaceous formation, and are composed generally of an open porous sandstone highly favourable to the absorption and passage of water. In Queensland (which State, on account of the greater extent of the utilization of its artesian supplies, may be fairly taken as a representative Australian one) they have been proved vertically to 700 feet, but are, in all probability, of a much greater thickness. They lie at depths below the surface varying from the outcrop level to over 5000 feet. They are freely developed in Western Australia, South Australia, New South Wales, and Queensland, and in the latter state lie under nearly two-thirds of the total area of the state, or 445,332 square miles. The rock outcrop, or water-intake, areas, have, according to special surveys made under the direction of Dr. J. L. Jack, the late Government Geologist, a combined length of over 1000 miles, with a minimum width of 5 miles, and one continuous outcrop in the northern part of the state has a length of 280 miles, with a minimum width of 90 miles. These outcrops are situated on the declivities of the ranges in country more or less above the plains of the interior, thus fulfilling the conditions necessary for an artesian well, which is a shaft bored through impermeable strata until a water-bearing stratum is reached, when the water is forced upwards by means of the hydrostatic pressure due to the higher level at which the

main, or supply, water was received. Over the intake areas there is a mean annual rainfall of about 26 inches.

The artesian rocks, with the whole Cretaceous formation, have assumed, after great geological changes—after upheavals and depressions of the Earth's surface—an undulating curvilinear form from their outcrop to their termination in the bed of the ocean. This is proved by borings to artesian water, along a line of country of over 1000 miles in length,

TOWN BORE AT CHARLEVILLE, ONE OF THE INLAND QUEENSLAND TOWNS RETICULATED BY THE BORE-WATER.

(From a photograph in the collection of the Royal Colonial Institute.)

in which, with a comparatively level surface, the depth varies from 200 to over 5000 feet.

In addition to the Cretaceous formation, there is, according to Mr. E. F. Pittman, the Government Geologist of New South Wales, every reason to believe that the Triassic or Jurassic coal-measures may lie under the Cretaceous formation, and writes that he would "even go so far as to suggest that the porous strata of the Frias-Jura formation may

constitute the chief storage beds of the artesian water supply of Australia." Such formations yield large flows of artesian water in the states of Nebraska, Texas, and Kansas in America, and a similar flow takes place in the Moree and Coonamble bores in New South Wales, which are in the Ipswich (Queensland) coal-measures, or Jurassic formation. This prediction of Mr. Pittman promises an immeasurable addition of artesian water to that already proved to exist in the Cretaceous formation, and affords further evidence of the great importance of a full and systematic development of the supplies.

According to the last Government Report, by Mr. J. B. Henderson, Chief Engineer of the Water Supply Department, the total number of bores in Queensland, including sub-artesian or non-flowing wells, is 891. Of these 6 per cent. only were made by the Government. The total aggregate number of feet bored was 1,066,605 feet, equal to 202·01 miles. The average depth per bore is 1197 feet. The total continuous yield from 532 bores at which the flow is known or estimated is, officially, totalled at 351,295,254 gallons per diem; 129 sub-artesian wells are estimated to yield by pumping 6,300,000 gallons per diem. There were sixty flows of over 1,500,000 gallons per diem, ranging as high as at Cunnamulla 4,500,000 gallons, and at Coongoola to 6,000,000 gallons per diem. The estimated daily requirements of Brisbane the capital city, with a population supplied with water, is 4,393,000 gallons, so that some of the single bores in the interior, discharging through a six-inch pipe, would meet the demand, and two-thirds of the total outflow would supply the daily needs of London itself.

I think the above figures show that there can be no doubt as to the artesian resources of Australia, and that they compare very favourably with those of other countries; but of the full systematic utilization of even the present outflow, I do not feel justified in speaking favourably, nor does there appear to be any indication on the part of the Governments, or of private individuals, to remedy the existing defects in the administration of this valuable national asset. It is to be hoped, however, that the Federal Government will move in this matter.

The following will show the position of artesian supplies, and their general treatment in Australia at the present time. Before artesian water was tapped, the country, during droughts, was the despair of pastoralists, as, from lack of rain, feed for stock had become exhausted; the creeks had dried up and the country had become waterless. By means of artesian flows over an area of about 120,000 square miles, as shown on the hand-map, and, as stated, of over 1000 miles in length, this condition has been somewhat remedied, although the number of bores made gives only 1 to every 148,440 acres of the proved artesian areas. Channelling has been made over the properties, so that the stock are provided at least with abundance of water—in fact, in some cases, too much of it—the low-

lying lands being converted into a mere swamp, but irrigation from the bore-water, even on a limited scale for growing feed for stock, has been, as a rule, neglected, although in many parts of this western country, three crops of lucerne and other fodder have been grown in the year. We know what valuable results have been attained by irrigation in other countries, and I think there is no doubt that if the part of Australia in question had been a closer settled and more of an agricultural one, the water would have been utilized long ago. In South and Central Queensland, under close cultivation, nearly two thousand of acres are irrigated by bore-water, and very successful

MAXMILTON No. 1 BORE.

(*From a photograph in the collection of the Royal Colonial Institute.*)

farms under similar irrigation have been inaugurated in New South Wales, notably the Pera bore Farm, Bourke district.

The last report of the Chief Inspector of Stock for Queensland shows a loss, mainly from droughts, of 4,887,294, or 32 per cent. of sheep in twelve months, ending with 1900. Since the end of 1892, when the number of sheep reached the maximum, the total of nearly 22,000,000 had become reduced to 10,339,185 on the last day of 1900, and those had been saved mainly by artesian water, for although the creek water had dried up there was still, in many districts, sufficient nutriment left in the grass to tide over the difficulty by the stock quenching their thirst in the bore-water. In New South Wales the total sheep at the end of 1891 was 61,831,416. By the end of 1899 the number had

become reduced to 39,612,126. The loss of sheep in nine years up to the end of 1899 was 31,340,000. Cattle had also been lost to a lamentable extent, 975,645 being the reduction for 1900 in Queensland alone.

These are very serious facts, both from an economical and a humanitarian point of view, and call for an earnest national movement. If the pastoralists cannot afford, under the terms of their holding, to fully utilize the artesian water, but must rely upon a rainfall, it is, I think, obvious that irrigation will have to be undertaken by Government.

In strongly advocating the use of artesian water as the most feasible means of combating the droughts, I will give a comparative estimate of the cost of reservoir (dam) making and artesian wells. In doing so I may point out that the Government of Western Australia (where I passed two years, 1896–97, partly under the Government in connection with artesian supplies) is carrying out works to supply water to the Coolgardie gold-mining district by means of a great reservoir near Perth, on the coast, and a pipe-line of over 300 miles long. The capacity of the scheme is five millions of gallons only, to be delivered daily at Coolgardie at a cost which will verge upon three millions sterling. Some of the Queensland bores, costing a few thousands of pounds, would fill the reservoir at Coolgardie *daily*, but then there is no artesian water under the Western Australian goldfields such as exists in such prolific quantities in the interior of Queensland and other portions of Australia.

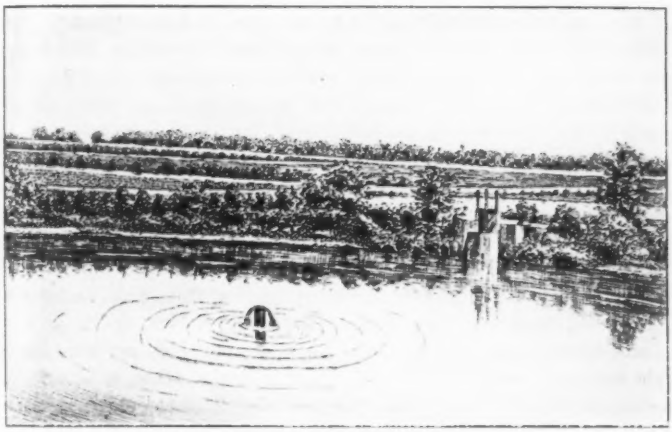
The cost of the Queensland bores, yielding, as stated, over 351 millions of gallons daily, works out as follows: Number of bores, 532; average depth per bore, 1197 feet = 636,804 feet at twenty-five shillings per foot—a fair average price—£796,005. The cost of reservoir (dam) making is as follows: At Taabinga, Queensland, which may be fairly taken as an example, excavation for reservoir and construction of dam, £314; area at high-water mark, 9·8 acres; maximum capacity of reservoir, 11,400,000 gallons. This conservation takes place usually only once a year, the accumulated water being doomed thereafter to deterioration and final exhaustion, quickly so, sometimes, during droughts. Many of the artesian outflows would fill the reservoir every two or three days with good naturally filtered water all the year round. So that, although the initial cost of the reservoirs is less than that of the bores, the quantity, reliability, and value of the water-supply of the latter is immensely greater.

Irrigation from these comparatively small reservoirs is out of the question, and they are only justifiable for the purposes of watering stock outside the artesian areas.

As regards a system of irrigation canals, besides the cost of the canals themselves—which would have to be of large dimensions—a succession of costly conservation reservoirs would have to be made in

order to maintain a head of water in the canals, for there are no flowing rivers at command. In Western Australia the Goldfields Water Conservation Department were making, whilst I was in the Government service, a series of reservoirs in various outlying parts of the fields, costing thousands of pounds each—the price of one Queensland bore—the inside of the reservoirs being lined with expensive concrete to prevent soakage. These reservoirs were designed, and are used solely for road traffic among the mines, irrigation forming no part whatever of the scheme.

I am convinced that irrigation from the rivers and lakes of the section of country in question cannot be adopted economically, and that



IRRIGATION FROM AN ARTESIAN WELL, TULARE, CALIFORNIA.

the only alternative lies in a greater increase of artesian supplies, and by their aid the adoption of systematic irrigation (for at least fodder for stock), and thus induce a larger pastoral and agricultural population to settle on the land.

In tracing artesian water from its source to its outlet in the bed of the ocean, we find the following facts. By a natural process, through the action of the sun's heat, the ocean gives up distilled water in the form of vapour, passing into clouds, which, on impinging on the ranges or higher lands, or under other atmospheric conditions, resolves itself into rain. This rainfall, coursing down the surface declivities of the country, is intercepted by the great areas of the outcropping porous artesian rocks, passes into and works its way along them, and in quantities of such enormous collective volume that they are incalculable upon any data we have, or are likely to have, at our disposal. Incidentally I may point out that the highly absorptive nature of strata

of the Earth's crust is shown by the chalk of the Cretaceous formation of the London basin. By elaborate research it has been found that each square mile of dry upper London chalk, one yard in thickness, contains nearly three millions and a half gallons of water, but the same quantity of rock is capable of absorbing, and it would contain if saturated, upwards of two hundred millions of gallons. This chalk stratum has a superficial area in England of 3794 square miles, upon which the rainfall is nearly equal to four thousand million gallons daily or equal to five times the summer stream of the Thames. Wonderful as its capacity for absorbing and retaining rain-water may be, I do not, however, think this chalk excels in those respects the artesian rocks of Australia, and it is far less free in giving off its water.

Artesian water, being under inherent pressure from a portion of its volume, will rise to the surface through any vent which will relieve that pressure. It thus overflows the surface in borings at all points at which the surface-level of the bore is below that of the outcrop of the water-bearing rocks. It is easily conceivable that sufficient water might be tapped by a great increase of artesian borings in Australia, which would provide permanent rivers and creeks in the interior from which systematic irrigation could be carried out. A portion of the waters of those rivers might possibly reach the sea, as did the waters of the rivers of old in the geological periods long since passed away. In any case, with a greatly increased outflow from artesian sources, there would be greater evaporation, increased moisture, and a far more equable climate than now prevails. Increased evaporation would complete the cycle, and prove, as I have indicated, that although the ancient rivers have been obliterated, the rainfall on the existing higher lands is sufficient to supply the underlying porous strata of the crust of the Earth with an incalculably enormous volume of water, the utilization of which on the surface above is only dependent upon the simple mechanical means at our disposal for tapping it.

The late Dr. Bancroft, of Brisbane, for whose opinions I have always had a reverence, propounded the question as to whether the action of the water from numerous bores in the interior of the country would induce moisture sufficient to coalesce with the rainy atmosphere of the coast, and thus determine rainfall in that interior. This question has often occurred to me in my practice as an artesian engineer, which has been in the driest parts of the interior country. In all irrigated or in all lake districts, with their accumulation of inland surface waters, the rainfall is greater than in the adjacent waterless country. This I found to be the case during a visit I paid some years ago to the chain of reservoirs which supply the city of Manchester, England, with water. With a heavy periodical rainfall, it was found that during spells of dry weather in the adjacent districts rain fell invariably, more or less, over the line of reservoirs. I remarked the same effect in many sections of

the Western States of America, where irrigation from bored wells on the closely settled farms induced a larger and more regular, although light, rainfall than that which took place in the unsettled prairie lands of the country.

When I first began to practise as a subterranean water-supply engineer in Australia—in the pioneering times in 1877—the lack of surface water in that fine country, and the evils attendant thereon, was, after an experience of Great Britain and five years' practice in the United States of America, a revelation to me. In the pastoral districts of Australia, in which artesian water has been since obtained, great benefits have accrued. The water has, in many cases, flowed in a natural course for over 50 miles from the bore, and it is now ready for the fullest utilization; but irrigation for the purposes of pasturage or crops is, as I have indicated, only in its initiative stage.

Many inland towns of the Downs country are supplied by reticulation from the bore-water under its natural high pressure. Single bores are there supplying an ample and constant supply for domestic purposes, and also for vegetable and flower-gardens *ad libitum*, and one scarcely knows which to admire most, whether the fruit trees in bloom or the blanched linen on the laundry-women's lines. The beneficial change already induced by the use of artesian water is apparent on every hand in those districts where it has been largely obtained. Live stock have been saved by thousands, and man made better, physically and morally, and with a fuller utilization of the water, the one great drawback of a great country will be largely neutralized.

Lord LAMINGTON: I believe, in almost every case where tried, bore-water after two or three years deposited such a sediment as proved harmful for agricultural purposes. Of course, water differed in the several bores, and some might be found adaptable. It seemed certain that lands that only required irrigation to make them fertile should, either by this method or by conservation of water, be turned to better use. But in the meanwhile, with hundreds of thousands of acres of rich lands on the coast, with a fair rainfall and more agreeable conditions of life, and which yet required to be settled and developed, it was unlikely that agriculture on a large scale would be taken up in the western country.

Sir T. FOWELL BUXTON: I think, from all we have heard, the prevailing opinion is that the artesian supply will go on perpetually flowing. We know if we have any receptacle in England, such as a gardening water-pot or anything else, and we draw from it, we run it dry. Well, I have never heard anything on that point, but when we are dealing with the water-supply of a great continent and talk of creating large rivers by which to reach the sea, it becomes a very important question whether there is any chance of running it dry. So far as I know, there was no solution of it in South Australia in my time. The object seemed to be to make a reasonable supply along certain tracks along which cattle and sheep might be driven. Now, it was considered very important to establish a cattle-track between Queensland and South Australia, going from the railway near Lake Eyre into Queensland to the head of the railway there, and the scheme which was more or less begun in my time was to try and establish an artesian well at every 20 or 25 miles.

I do not know whether that has been maintained, or whether it has been taken up by the Government of Queensland on that side. But there certainly was no attempt, so far as I understood it, to produce a supply, a big enough irrigation scheme, that would mean cultivation of land. It was only attempted for the supply of cattle; large troughs, as I saw them in South Australia, were established for the feeding of cattle, and I think I was surprised and rather disappointed by seeing a large chute, almost as high as some of those we have been seeing pictures of this afternoon, a considerable chute going up nearly as high as this room, yet apparently, when used for irrigation, go such a little way. I remember seeing a garden just south of Lake Eyre, where an attempt was made to produce dates, and there were certain gardens laid out with date palms and other things; but the irrigation seemed to go such a small way, it may be five, or six, or eight, or ten acres, but it did not extend to anything like a large area, and apparently it would have gone if the supply had been large enough. I hope I have made my question clear, and have not occupied too much of your time.

Dr. H. R. Mill: There are several points in this most interesting paper on which I should like to speak, and I should like to put my remarks in the form of questions, or, at least, to ask the opinion of Mr. Cox upon what I have to say. Of course, the importance of the subject is apparent to all geographers, and I think Mr. Cox deserves special thanks for bringing forward so very clearly the enormous importance of underground water-supply in the case of this particular continent of Australia. But then comes the question, Is that water-supply going to be continuous? Is there under the surface of Australia a great accumulation of water stored up from remote periods in the past? That is a theoretical point which, to my mind, is of vast importance. I do not know, but there were several statements in this paper which suggested the idea that the author possibly considers that the water stored up in these rocks dates back, some of it at least, to comparatively remote geological periods. Now, from the study of the general phenomena of physical geography, one is inclined to believe that the condition of things should assume a state of equilibrium; that the storage of water in the strata would go on to a certain point, beyond which any fresh accession would be counterbalanced by loss, either a flow off into the sea, or perhaps by the rising of the water to the surface and its removal quietly by evaporation; and I would put it as a question whether it is not extremely probable that the available supply that can be drawn from artesian wells is not simply that proportion of the rainfall of the country which percolates into the soil. We know that in our own country there is an immense quantity of water saturating the chalk which lies beneath the London clay, and that water has been taken from that supply to a greater extent, I suppose, than in any equal area on the surface of the Earth, and we know that as a consequence of the flowing of artesian wells, and the pumping of non-flowing bores, the level of saturation in the chalk has been steadily going down. The amount of water removed now almost entirely by pumping—because the artesian wells no longer flow on the surface—is probably in excess of the amount of water brought in by the rainfall, hence the wells have always to be deepened in order to yield. The same, I am very much inclined to believe, will be the case in Australia if any particular artesian basin is treated as if its supply were inexhaustible; but then we must remember that even if that is so, the amount, though not inexhaustible, and though perhaps not even incalculable, is still so very large that it will admit of an enormous amount of development before these limits begin to be practical problems. There is another point of very great interest which is mentioned in the paper, and that is with regard to the effect of a surface of water in attracting rainfall. Mr. Cox referred to the reservoirs supplying Manchester.

I suppose he meant the Longdendale reservoirs, and there it would be easy to ascertain whether it is really the case that the existence of this water surface has produced any increase in the amount of rainfall, or even in the frequency of showers. Our usual experience is that when you have a level surface of water, the amount of evaporation is greater than any increased rainfall that would be induced by the lower temperature of the water, which, of course, is the only way in which condensation would be produced on the surface. As a rule, we find a slight rise in the elevation of the land will produce a greater rainfall than a lowering of temperature over the surface. I have been extremely interested in the paper, and the practical outcome of it seems to be that, side by side with the utilization of the artesian water, we must go on with the study of the rainfall, which in Australia is perhaps more capricious than in any other part of the world, and so requires a longer series of years of observation in order to ascertain the average rainfall; in fact, I do not believe that as yet we know the true average rainfall of any part of Australia, because the records have not yet been kept up long enough.

Mr. Langler: Might I inquire what is the basis of the remark made in this paper with regard to the absence of artesian water in Western Australia? Is it based on geological theory, or is it on actual experience?

Mr. Gibbons Cox: In regard to the remarks made by Lord Lamington, I think irrigation water, that is to say, all water for irrigation purposes, must vary in quality; even some of the best of the river-water is not good for irrigation. And, further, a good deal of the water that comes from these bores, on being exposed to the air for a time, does very well for irrigation. I think it is a local matter to a great extent. When we take into consideration that immense areas of land have been irrigated in Algeria, America, and Europe, I think there is every reason to believe we shall get the same results in Australia. As there is such an enormous area of artesian rocks in that country, there is, in all probability, a vast quantity of water adapted for irrigation. There may have been some cases in Queensland where it has not been a success, but that must have been because the water was not adapted for the purpose. I think you will find that neither the Government nor private engineers claim that all water is good for irrigation. Some is adapted for wool-washing, other is good potable water and for irrigation, and I do not think it is safe to assume that all the artesian water of Queensland is unfit for raising crops. Irrigation is only in the initiative stage. Of course we cannot be certain, but I am inclined to believe that the future will see a very extensive system of artesian irrigation.

In answer to Sir T. Fowell Buxton, with regard to whether artesian rocks exist in the Lake Eyre district; the most recent researches of geologists and engineers show that such rocks do exist.

Sir T. Fowell Buxton: My question was, Do they exist there exclusively, or almost exclusively?

Mr. Gibbons Cox: I do not know that; but in the Lake Eyre district there are remains of the old Cretaceous ocean, and certainly Cretaceous depo-its took place there. Although the lake-water is salt, I think that in the future very fine artesian water will be obtained from below.

In reply to Dr. Mill, as regards permanence of supply; I do not think there is any doubt about that. If the enormous areas of artesian country are taken into consideration, the areas proved by actual boring down to the water-bearing rocks, which have given large flows of water; if you take also the outcrop areas as proved by actual surveys by the Government geologist, and the fact that there has been quite an average of certainly 20 inches of rainfall as shown by the

official gaugings of the last fifteen or sixteen years, you will get at such an enormous volume of water stored up repeatedly, or naturally conserved, in the ground, that to my mind the quantity is almost incalculable. Although we find that the daily flow in Queensland is 351 millions of gallons from 530 bores, that quantity is in reality a mere bagatelle. I think there can be no doubt as to the permanence of supplies providing the rainfall continues, and we have no reason to suppose it will not do so. Another matter is, that if you take into consideration the porous nature of the rocks of the crust of the Earth—even granite, as I have remarked, is so constituted — and that the Earth has been receiving rainfall from the very earliest times, it will be apparent that the crust must have been fairly saturated irrespective of the rain that has fallen in our time. The Earth is absolutely charged with water, and a portion, no doubt, of the artesian flows has been accumulating for ages. But we are inclined to think, from the fact of the water being comparatively fresh, that it is not in a state of utter stagnation, or, in other words, that as it is not highly impregnated with saline and other alkalies of the Earth, it is moving. The water (referring to the map) is, in fact, slowly passing down through the porous water-bearing rock until it enters the great Australian bight below the surface of the ocean, and also, in all probability, into the Gulf of Carpentaria. Further, as regards permanency, I think it will take very many thousands of bores before an effect is appreciably made on the supply. Dr. Mill said that, the draught having been very great on the London basin, the head of water had naturally been reduced, although it took a great many years to produce that result. Now, if we take the area—and I scarcely like to make a comparison of my native country with countries like that one—if we, however, compare the area of Queensland with the London district, and if we assume that the Cretaceous water-bearing rock of Queensland is highly porous (and it is a question in my mind whether it is not equally as porous, and equally as good a water-conveyer, as the London Chalk; it certainly parts with water more freely), the accumulation of water in that State is, as I have desired to impress upon you, so enormous that the comparison will not, I think, hold with regard to the London district.

With regard to the question Mr. Langler put to me as to Western Australia. The artesian rocks in that state are of a rather different nature. They are calcareous sand-rocks, belonging to the same Cretaceous formation, and are called Eolian sandstones. At Perth they have been very successful in boring, and have produced splendid water at a depth of 700 feet in the railway yard. It is a very fine flow—it is, in fact, so strong that the Railway Department could not use it all, but made arrangements with the municipality, the money paid by that body covering the interest on the cost of the bore. It has been found at Bunbury, on the south-west coast, and at Guildford, about 18 miles up the Swan river from Perth, where there are many fine flows. The Cretaceous belt is not confined to the south-western coast, but extends to Geraldton and Onslow, on the western coast, and they have it up here at Freycinet Point, and are also boring in the Kimberley district. Much of the artesian water in the south comes from the Blackall ranges. The northern district has had a bad name for dryness, but I think it extremely likely that artesian water could be obtained all over there. An amount of experimental work—and it may be to a great extent so called—has been left to private enterprise, the Government not having supported the matter as much as I think it ought to have done.

The CHAIRMAN: I think it is very encouraging for us to hear from Mr. Cox that he has great faith in the permanence of the water-supply of these artesian wells. Certainly that was not the opinion of everybody in Queensland when they were first started. When I was in Queensland, there was a good deal of doubt on

the part of some persons as to whether the supply would be permanent, and endeavours were made to prevent waste in the water. It was turned on at certain hours and turned off again. No doubt a better opinion has prevailed since then, and it is believed that the water-supply will be practically permanent. And, as Mr. Cox says, of course the number at present in Queensland, compared with the area of the country, is very small indeed. There are many interesting points connected with artesian wells which have not been touched upon, and about which perhaps a good deal is not known. I would remark on the extraordinary difference in the temperature of the water. I believe there is a very great difference indeed. That very beautiful artesian well at Charleville (?), to which the lecturer referred, and which I have visited on various occasions; the water comes out at a temperature of about 100°, and I believe it is very much higher in some other wells, and possibly lower in others. That water is utilized in various ways. For instance, there is a nice bath, where you can get a very good warm bath for a charge of a penny. Then there is a good deal of difference, I believe, in the taste of the water of these various wells, as is natural, as they come from different soils; but I believe most of the artesian water is quite palatable to animals, but a good deal is not agreeable to us to drink. I am sure you will all agree with me that Mr. Cox deserves our thanks, not only for his lecture on the artesian wells and the readiness with which he has answered all the questions put to him, but because long before this time he commenced to make a general study of the question of artesian supply, and I may say a great part of his life has been devoted to that study, and I believe with a great deal of success. I would ask you all to allow me to convey your thanks to him for the interesting lecture he has given us.

Mr. Cox: I am extremely obliged to you for the very kind way in which you have received my paper. It has been a great pleasure to me to read it before the Geographical Society, because it is a Society of very considerable scientific research and importance. The questions that arise out of this artesian water-supply are very great and very voluminous, but I think, as I said before, that there is immense quantity of water in the crust of the Earth which can be got out, and I believe it can be used for irrigation purposes to a very great extent.

Dr. R. Logan Jack, who was unable to attend, sends the following remarks on Mr. Cox's paper:—

Much credit is due to Mr. Cox for having so clearly drawn attention to the benefits of irrigation. There can be no doubt that at present all the surplus of the bore-water beyond what is drunk by stock is practically wasted, except for the slight improvement in the humidity of the climate which must result from the creation of a number of open water-bearing gutters. To cultivate rice on the low-lying grounds in the vicinity of the bores would improve the climate, as it has done in China and India, but Australian bushmen are not large consumers of rice, and the factor of freight to the market will determine whether the cultivation will pay. The question of the cultivation of fodder for the sheep will be looked upon by the squatter in the cold light of figures. He will cipher it up something like this:

"My bore yields, beyond what the stock drink, 100,000 gallons per day. What can I do with that? I could (after making reservoirs) pour 6 inches of water four times a year over 70 acres of land, and cultivate lucerne. As a continuous growth of lucerne may yield eight crops, or 12 tons per acre per annum, let me assume that my partial irrigation will yield four crops, or 6 tons per annum. My 70 acres will yield 420 tons, or 940,000 lbs.

"To keep a sheep alive for, say, 90 days in the year when the natural grasses fail, or the animal cannot reach them, will take 8 lbs. of fodder per day, or 720 lbs.

in the year. My whole 70 acres will thus tide 1300 sheep over the average annual period of drought. The capital value of my sheep is 9s. per head; thus 1300 sheep represent £582. What will it cost me to save 1300 sheep, value £582, which would otherwise be lost? I have my doubts about getting labour for the tropical west at coast or southern rates, and I must reckon up the capital value of reservoirs, etc., but say that my 420 tons of fodder cost me, as I believe is about the average on the coast, 25s. per ton, or £525; the difference between that and the £582 is very small."

With reference to the above, Mr. Cox writes—

In putting such words in the mouth of the cold-blooded squatter, I admit that every one of the figures I have supposed him to use may be erroneous, because I have little practical knowledge either of pastoral or agricultural pursuits. In many cases, however, I believe the squatter knows very little more about agriculture than I do, and no doubt he will seek expert advice on that subject from the farmer. Personally, I should be delighted if, when the two lay their heads together, they find some radical error in my *data*—much as, for instance, that eight crops of lucerne can be cut annually in place of four, or that the cost per ton will be only half what I have supposed, or that some other crop will be more profitable than lucerne. Nevertheless, I assume that the squatter, like the sensible man he is, will reason on such lines as I have indicated. If, with the help of the farmer, with co-operation, and perhaps with the assistance of the Government, he can see his way to make irrigation profitable, the whole country will benefit, and the full value, in place of an infinitesimal proportion, of the generous provision of nature will be realized. It is difficult to contemplate the present waste philosophically.

I am pleased to find that so high an authority as Dr. Jack confirms my opinion as to the capabilities of the present outflow of artesian water in Queensland, and that there is, in his opinion, a means of practical irrigation from that source.

		Gallons per diem.	
The present outflow is			351,295,000
Allow for non-irrigable water 10 per cent. Allow for soakage and evaporation per diem 10 per cent.	20 per cent.	70,259,000	
Water used per diem by maximum number of sheep (year 1892)—22,000,000 sheep at two gallons each per diem		44,000,000	
			114,259,000
			237,036,000

1 inch of rainfall gives 22,622 gallons per acre.

20 inches per annum (allowing four waterings of 5 inches each) gives 543,485 gallons per acre; and 237,036,000 gallons per day would irrigate 151,191 acres with 20 inches of bore water per annum, or would irrigate at the rate of nearly 300 acres at each of the 532 bores treated upon.

THE RUSSIAN TIBET EXPEDITION, 1899-1901.

By Captain P. K. KOZLOFF.

In the spring of 1899 the Russian Geographical Society sent out under my direction an expedition to Central Asia and Tibet, organized with the money granted for that purpose by the Emperor. My

travelling companions were: Captain-Lieut. of Horse Guards, A. N. Kaznakoff, who for the first time undertook such a long and difficult journey; and B. Th. Ladyghin, who accompanied me for a second time. Kaznakoff undertook to make collections of insects and molluscs, while Ladyghin was to look after plants and butterflies; at the same time, owing to his excellent knowledge of the Chinese and Manchurian languages, as well as of the Turkish dialects spoken in Eastern Turkestan, he collected various ethnographical and historical materials, and was the intermediary in our relations with the Chinese authorities. Both could make surveys during the excursions which they undertook independently from the main caravan. I kept the geographical, meteorological, and natural history diaries, made the survey along our route, and determined the astronomical positions. At the same time I collected birds and mammals. In short, every one of us had his own sphere of activity.

The convoy of the expedition consisted of sixteen soldiers from different parts of Russia: eight grenadiers, one man from Omsk, six men from Transbaikalia, and one from Biysk. They were under the command of Sergeant Ivanoff, an experienced veteran who took part in three previous expeditions of Prjevalsky, Pyevtsoff, and Roborovsky. We had, moreover, two men from Transbaikalia who both had also accompanied Prjevalsky, one of whom was a very good taxidermist, while the other was an excellent hunter, and both could render some service as interpreters. For Mongolian, we had an interpreter from Transbaikalia, Tsokto Badmajapoff, who proved to be very useful in different ways. Beside their direct duties of looking after the animals and harnessing them, the men soon learned to help us in botanical and entomological preparations.

It was intended that the expedition should follow the Chinese or Eastern Altai from the Altaiskaya village to the eastern extremity of these mountains. Then it had to cross, wherever it would be possible, the eastern portion of the Great Gobi, and, through the province of Han-Su, had to enter Tsaidam, where further preparations would be made for the exploration of Eastern Tibet, which is known under the name of "Kam" (Kan-tsian by the Chinese). The return journey was to be made along the already well-known routes through the Alashan and *viâ* Urga to Kiakhta.

We all met in the Altaiskaya village of the province of Semipalatinsk at the beginning of July, 1899. The work went on with great energy. Ladyghin bought the camels, and all of us prepared the boxes and arranged our baggage. The men practised shooting, each man studying his own rifle. Scientific collections were also made, and we all burned with the desire to start on the great journey. We started on July 14 (26th N.S.), after a *Te Deum* had been sung, and I had read to my travelling companions the words of a telegram by

which the Emperor and the President of the Academy of Science bade God-speed to the expedition.

Our caravan, which consisted of fifty-four camels, fourteen horses, and a small flock of sheep, was divided into seven sections, and slowly began its journey up the Bukhtarma river, along the foot of the forest-clothed Narym range. We had splendid weather, and there was plenty of work for every one. On August 1 (13th N.S.) the expedition crossed the frontier of Russia by the pass of Ulan-daba, and here it divided into two portions. I followed the high-road to Kobdo, which had already been visited by General Pyevtsoff, while my comrades Kaznakoff and Ladyghin took a more southern route lying nearer to the main axis of the Altai, with the purpose of exploring the sources of the Kobdo river and the Alpine lakes, of which there is a profusion in this part of the Altai. They had also to explore the fauna and the flora of these lakes, and took with them for that purpose a small canvas boat, as well as dredges, thermometers, and other hydrological instruments. My comrades came to Kobdo four days after my arrival thither, and their excursion was quite successful. They could not, however, make much use of the canvas boat, on account of the strong winds which prevailed during these days. Soundings were made on the two Kobdo lakes, upper and lower, which give origin to the Kobdo river. After a few days' stay in Kobdo, we resumed our journey.

Thanks to our good relations with the local Chinese authorities, they endeavoured to help the expedition in all possible ways. Our intention was to explore the Eastern Altai by means of a number of detached excursions which were to be made by my comrades, while the main body of the caravan would move along the northern slope of the Altain-Nauru. The Mongol inhabitants of this region were consequently warned beforehand by the Kobdo authorities, and they quite willingly gave us experienced guides and even transport animals for this purpose.

Soon after we had left Kobdo, and were near the temple Tuguryughen-kyure, situated on the Tsenkyr-gol river on the northern slope of the Altai, I sent out my comrade Ladyghin for the exploration of the southern slope of the Altai, parallel to the line of my journey on the northern slope. He had, besides, to explore the river Bulugun and ascertain whether beavers are still found in this locality, or only lower down on the Urungu river. My comrade brilliantly accomplished that commission. He crossed the Chinese Altai twice, explored the Bulugun river, and followed the southern slope of these mountains as far as the meridian of Lake Khulmu-nor, where he joined the main caravan, after having made 300 miles of survey. The eastern portion of the southern slope was explored by Kaznakoff, who crossed the route that was followed by Prjevalsky from Urga to Alashan, and afterwards went round the eastern extremity of the Altai, so as to meet me while I

PART OF EASTERN TIBET

Showing routes of Cap.t P.K. Kozloff's expedition

was following the northern slope. As to myself, I followed the northern slope of the Altai, making at every step new discoveries, while we took advantage of the opportunity, which we did not foresee, of exploring the western part of the Gobi as well, and Ladyghin was sent out to cross the great desert in its western part, in the meridian of Ulyasutai and Su-chu.

The Eastern Altai has a general direction from north-west to south-east. On the meridian of Kobdo it must be divided, however, into two parts, widely different from each other. The western part is high, contains masses of glaciers and of snow-clad peaks. It is very rocky, covered with forests, and receives large quantities of rain and snow. To the east of Kobdo the Altai assumes a quite different aspect; it becomes low, and rarely reaches the snow-line with its high summits. Such summits are met with only on the meridian of Lake Khara-usu, and further east they become very rare. The main summits are Tabyn-khumustu, Khara-atsyrga, Ikhe-bogdo, and Baga-bogdo. The first is in the meridian of Kobdo; the second in the meridian of Lake Sharghin-tsagan-nor; the third is nearly in the longitude of Lake Orok-nor; and the fourth of Lake Tatsyp-nor. All these lakes are situated on the northern slope, and I passed them on my route.*

Owing to the dry winds coming from the south, *i.e.* from the Jungarian desert and the Gobi, the eastern Altai has but few forests and alpine meadows; nevertheless, the Mongols keep here large herds of sheep, cattle, and horses, and some camels. The gentle slopes of the mountains on the northern side are covered with excellent grazing-grounds, while on the southern slope, which is covered with a mixed vegetation, characteristic of both the prairies and the deserts, one finds very good pasture grounds for the camels, which are the chief means of livelihood of the Mongolian natives. Neither of the two slopes of the Gobi-Altai, as I name the Chinese Altai, may be said to be rich in rivers. The tree-vegetation of these mountains is poor as a rule, and only the slopes of the Baga-bogdo are a little better off in this respect. In the gorges of these mountains we found a considerable quantity of the Euphrates poplar (*Populus euphratica*), and three or four different species of bushes, as well as some thickets of willows. As to the animal life, we did not find a great variety of species, but considerable quantities of wild sheep were seen. In the valleys of the northern slope we found large flocks of antelopes (*Gazella gutturosa*, *G. subgutturosa*, *Saiga tatarica*). Very often we saw also large quantities of wolves, foxes, and hares.

* This part of the journey was described in letters published in the *Izvestia* of the Russian Geographical Society (*Geographical Journal*, January, 1900, p. 56). The main point of interest, for the geographer, of this part of the journey is in its having established the *border-range character* of the Sailughem range.—P.K.

At last we reached the wells of Chatseringhi-huduk, where we stayed for some time for the arrival of Kaznakoff, and the preparation of the collections which had to be sent back to Russia, together with reports on the work of the expedition and correspondence. Kaznakoff soon joined us, after having most successfully accomplished his journey. He had covered nearly 600 miles with his survey, which he connected in two places with the surveys of Prjevalsky, and he had passed round the eastern extremity of the Altai. In this way the Gobi-Altai was explored all round, and crossed several times by the members of the expedition. Altogether, we had covered nearly 2900 miles with our surveys, and made rich collections in natural history, ethnography, and the archæology of this part of Mongolia.

We had now to explore those parts of the Great Gobi which had hitherto not been visited by any European, and were considered almost entirely inaccessible. In the western portion of the great desert, Ladyghin was already making his explorations, in those parts of it which lie between the route of Potanin, *viâ* Etsin-gol to the Altai, and the imperial route from Hami to Su-chu. Kaznakoff and myself had now to explore its eastern portion.

We left Chatseringhi on December 1 (13th N.S.), 1899. For many hundreds of miles we had before us the renowned desert of the Gobi, the unknown parts of which have been recently narrowed more and more under the invasion of the Europeans—surveys having already been made on its western and eastern, northern and southern borders. I took for our main caravan the meridional route leading to Lan-chu, while Kaznakoff went at the same time in a diagonal direction—first towards the lakes which are formed by the Etsin-gol river, and thence to the encampments of the Alashan prince. He had thus to explore the most difficult central part of the Gobi. This bold journey could only be accomplished after we had collected much information about the character of the region, and owing to the excellent relations which we had formed with the Mongolian princes and their subjects, who did their utmost to help us in our difficult enterprise.

Want of space will not permit me to describe in more detail the Gobi, the character of which has in reality nothing in common with what we find in earlier descriptions. The Gobi was usually represented as a flat land covered with sand, showing no signs of hills, except in its western parts, where it was crossed by Potanin, and where mountains running eastwards and south-eastwards were represented on our maps. It appeared, however, that all the northern part of the Gobi, for about 200 miles southwards, on the routes of both Kaznakoff and myself, represents a country which is crossed from west to east, and from north-west to south-east, with more or less high

mountains, undulations, and ranges of hills, in the valleys and gorges of which one finds—not frequently, of course, but still occasionally—nomad Mongols with their herds of camels. This part of the Gobi is everywhere easy of access, and is traversed in all directions by routes provided with wells which contain sweet or slightly brackish water.

The southern part of the Gobi, on the contrary, represents indeed a barren desert, covered with masses of sand, and only occasionally intersected with low ranges of hills, of which the highest on my route were the Yebarai hills. The crossing of the Badan-chirin sands cost me a good deal, because all our riding-horses died one after the other from want of grass and the fearful cold, although we had taken with us some corn to feed them. We were thus compelled to ride on camels, and consequently suffered at the outset from giddiness; in fact, we preferred to walk and thus keep ourselves warm.

The central part of the Gobi, which was explored by Kaznakoff, is also hilly in its northern portions and sandy in the south; but my comrade succeeded in crossing it quite successfully, thanks to the Mongols, who willingly gave them the very best camels, and helped them to support the fearful cold and other difficulties.

The western portion, which was explored by Ladyghin, also proved to be very interesting. He had to cross a still higher hilly tract covered by ranges of mountains, large and small, having as a rule a south-eastern direction, and separated from each other by broad dreary desert valleys covered with gravel. He found no sands at all; only when he was already near to the cultivated region upon which the town of Su-chu is situated, he had to cross a narrow strip of sand barkhans (dunes), named Narin-hulusu, covered with low hard rushes; this belt of sands stretches for a long distance further east. Nearly in the centre of the desert he crossed and explored a fairly high mountain range, which is known to the Mongols by the name of Aty-bogdo and Koku-tomyrty. It is a high and narrow range of hills, which, notwithstanding its position in the centre of the desert, proved to be rich in animal and vegetable life. In all the gorges of its northern slope there are small streams, springs, and wells, round which one sometimes finds thickets of *tograk* wood (*Populus euphratica*) together with various bushes, of which the tamarisk and one species of willow, both covered with clematis, succeed best. The *Nitraria Schoberi*, and various species of *Lycium*, *Myricaria*, roses, *Salsola*, *Glycyrrhiza*, *Poa*, *Panicum*, *Amaranthus*, *Centaurea*, *Lactuca*, *Statice*, *Saussurea*, *Polygonum*, several Chenopodiaceæ and *Orobanche* also appear in quantities. Besides, in all the gorges one finds thickets of rushes, and on the slopes of the mountains certain species of rhubarb, much liked by the Mongols, while the steppe-grass (*Stipa orientalis*) attracts every year a number of Mongols from the Ederen region.

The animal life is also fairly varied and richly represented. One finds here in the valleys the *khulan* (*Asinus onager*), the wild camel (*Camelus bactrianus*), gazelles (*Gazella subguttarosa*), and in the mountains plenty of foxes, wolves, argalis, roebucks, and even some bears. My comrade, however, did not meet with any of the latter, although he was told that they live in this neighbourhood and feed upon rhubarb roots, which are also considered a delicacy by the Mongols, who bake them in hot ashes. In the thickets of the valleys my comrade found the *Uklik* (*Caccabis chucar*), the Bearded Titmouse *Panurus biarmicus*, a species of the *Alaudula*, some Saksaul sparrows, and so on. He was told that formerly bears were also found in this neighbourhood, but had disappeared.

After having thus completed the exploration of the Gobi, which was crossed in three different directions, so as to leave no unexplored region in the great desert, the members of the expedition hurried to the meeting-point, which was the Buddhist monastery Chortan-tau, situated near to the town of Sinin, on the Dai-tun-ho river. In this monastery, which is located in a beautiful, picturesque, and woody gorge, my great teacher, N. M. Prjevalsky, stayed on several occasions, and during his fourth journey I visited it as well. I expected to meet with a good reception in this monastery from the lamas, who so highly respected my late teacher, and I was not mistaken. Ladyghin came to Chortan-tau one month before me, and as soon as the lamas learned that he was a member of an expedition conducted by a pupil of Prjevalsky, and that the expedition would soon reach their monastery, they very kindly managed to set apart certain buildings for our reception. Both myself and my comrade, Kaznakoff, as we were passing through the town of Lan-chu, had the pleasure of making the acquaintance of the members of the China Inland Mission, Messrs. Belcher and Fiddler, who were extremely kind to us, and helped us in different ways. When I reached the above-named monastery, the Ghegens received me most cordially, and vied with each other in inviting me to dinners and to divine services, and in showing me their temples. Taking advantage of our stay at this spot, I made large collections of birds and mammals, and left here part of my baggage.

In the mean time I sent Ladyghin, and afterwards also Kaznakoff, to Sinin, to the governor of the province, to have a talk with him about our further journey, to settle all details, and especially to get the mail from Europe. At Sinin Ladyghin could not refuse the hospitality most kindly offered to him by Mr. and Mrs. Robinson, members of the China Inland Mission.

At last, leaving part of our collections with the lamas in the monastery, I left this place and went with my caravan to the town of Dan-gher, where we all met. The Governor of Sinin gave our expedition all necessary orders and letters of introduction to the local

Tibetan princes, who are under the Sinin governor. He also aided Kaznakoff in sending a caravan with provisions to Tsaidam. In Tsaidam we stayed at the monastery Barun-tsasak, and in the expectation of spring, we prepared everything for our Tibet journey. A meteorological station was built, and part of our collections was left at this depôt, as also all our camels. Four men from our convoy, under Sergeant Ivanoff, had to remain at the depôt, and Sergeant Muravioff was entrusted with the meteorological observations.

KOZLOFF MAKING ASTRONOMICAL OBSERVATIONS WHILE WINTERING IN KAM, EAST TIBET.

The spring was, however, slow in coming. The neighbourhood of Barun-tsasak was very dreary, and only in the valleys of the northern slope of the gigantic range of Burkhan-Budda some signs of reviving nature could be detected by the end of April. Kaznakoff was perhaps the most successful in making his collections.

On May 17 (30th N.S.), 1900, we at last left this depôt, and, carrying our baggage on yaks and hainyks, we began our journey by crossing the Burkhan-Budda range along the Nomokhun-gol river. This was done

successfully, and in June, after having slowly crossed the two great ranges of Burkhan-Budda and Amnen-kor, we reached the shores of Lake Russian, pitching our camp at the place where the Hoang-ho flows out of this lake. As we were crossing the Amnen-kor I obtained several specimens of the very pretty Fringilline bird, *Leocosticte roborowskii*, which was described by Prjevalsky, who possessed, however, but one single specimen. Two days after we had reached the lakes of the upper Hoang-Ho, we saw coming large parties of the N'Golok robbers, who were returning from Lhasa with their prince, Hombu-rinchim-shiam. I tried to enter into relations with them, but this was of no use, because their prince, although he had given a solemn pledge at Lhasa never to fight more, said quite frankly that he could not answer for his men, who were sure to attack the expedition as soon as it appeared on their territory. As I did not want, on my very first entry into Tibet, to make use of arms for the conquest of scientific discoveries, I preferred to change my direction and to go straight southward, so as to cross the territory of the N'Goloks on my return journey only.

After having explored with Kaznakoff the northern shores of the lakes of the upper Hang-Ho,* we went along the isthmus which separates Lake Russian from Lake Expedition (Orin-Nor and Jarin-nor; also Hchara-mtso and Hnora-mtso), and crossing the river which connects both lakes, we entered the valley of the river Jaghyn-gol. In order to cross the great watershed between the Yellow and Blue rivers, we followed the course of this river, and on the summit of the watershed we found a marshy, open depression in the mountain range, the altitude of this pass reaching 14,700 feet. From this pass we saw to the north of us the high plateau of Tibet stretching north and west in a succession of gigantic waves, and to the south of us we had the deep gorges and the sharp snow-clad peaks of the Gatu-ju group of mountains.

The plateau of Tibet, upon which lie the sources of the mighty Yellow and Blue rivers and the Mekong, covers with its massive structure an immense area. In its eastern portion, to the east of a diagonal line which runs south-west to north-east, it falls under the influence of the monsoons from the Indian ocean, and is consequently rich in atmospheric precipitation, which feeds these rivers; but to the west of this line, where the plateau attains a still greater height and has a still more even surface, the dryness of the climate progressively increases, and, instead of a covering of grass, we find only a gravelly desert, which was so truly described by M. V. Pyevtsoff as "dead land." In proportion as one moves further east from this diagonal climatic line, and the rivers which flow this way become mightier and

* Ladyghin made soundings in Lake Russian for several miles from the outflow of the Hoang-Ho; they gave depths up to 15 fathoms.

mightier streams, the plateau appears more and more eroded, and assumes the features of an Alpine region.

Deep river-valleys and narrow gorges alternate with the high crests of the water-divides. The roads, or the footpaths, as the case may be, either descend to a great depth or climb to a great relative and absolute height. Here a mild, and there a rough climate; belts of luxurious alternate with belts of an extremely poor vegetation; spots occupied by man, and lifeless summits of the grand mountain ranges—all these alternate in rapid succession before the eyes of the traveller. Most beautiful panoramas of mountains unfold at his feet as he gazes towards the remote horizon, and soon after everything disappears as he stands between the narrow sides of the rocky gorges, where he hears the roaring of the blue and foaming waters, while on the high levels only the howling of the storm fills the air.

As soon as we entered the basin of the Blue river we felt the surroundings to be of a milder character. The roughness of the climate which we had experienced heretofore had been left behind on the last mountain pass. With every step down the gorge it became warmer and drier; the eye rested upon pleasant landscapes. Our herbarium and our entomological collections rapidly increased, as we saw everywhere carpets of flowers, with butterflies, and all sorts of insects fluttering about. Only, owing to the presence of man, we did not see any more representatives of the great mammals which we used to find in such numbers on the plateau.

We soon entered into friendly relations with the first Tibetans, of the Hoshun of Namtso, whom we met, and this friendly intercourse helped us in our further journey southwards. With the aid of the old prince, Namtso-Purzek, and his sons, we found no difficulty in crossing the Blue river, and, going next over a high mountain range, we reached on its other slope the I-chu, a tributary of the right bank of the Yang-tse-kiang. Continuing our journey up this tributary, we reached at the beginning of August the shores of Lake Rhombo-mtso, round which are the settlements of Tibetans from the Dett Hoshun. The elder of these, as dirty as his companions, made his appearance at our bivouac fire, quite frightened. With trembling hands he brought me some presents, and had difficulty in pronouncing his greetings on account of the shaking of his voice. It soon appeared that the cause of this fright was that the Tibetans were saying among themselves that Russians have come at last to revenge the death of their murdered comrade, by whom they meant the well-known French traveller, Dutreuil de Rhins, who perished here from the hands of the Tanguts of the Dett Hoshun.

The expedition soon reached the monastery of Jarku, which was also visited during our stay there by the embassy from the Governor of Sinin, which visits this country once every three years to collect

the tribute. It is interesting to note that our stay in this monastery was precisely at the time when the Boxer uprising broke out in China, but neither ourselves nor the Chinese authorities knew anything about it. We spent our time in mutual invitations to dinners and to fishing-parties in the river, on the shores of which we had our encampment.

After having bade good-bye to the Chinese, who gave us for a few days an interpreter of the Tangut language, we left Ja-chu on August 21 (Sept. 3), 1900, and continued our journey up the river Bar-chu, which brought us to a broad wide valley, closed in the south by a mighty mountain range covered here and there with perpetual snow. This was the watershed between the Blue river and the Mekong. This yet unnamed range of mountains stretches as an immense wall from the north-west to the south-east, and is covered with excellent pasture grounds, visited by the numerous herds of cattle of the nomads. The pass Gur-la reaches 15,200 feet of absolute height, and when we were on its southern slope we were already in the basin of the Mekong. For several days in succession we continued our journey south-westwards, crossing several parallel chains of mountains and numbers of large and small rivers which were carrying their waters to the south-east amidst an imposing labyrinth of mountains. We crossed first the Je-chu, and next the Ja-chu rivers, which together with the Nomu-chu (a river which flows further south and takes its origin near Lake Tengri, in the north of Lhasa, where it is known under the name of Nak-chu) form the river Mekong. We stopped near the frontiers of the district of Lhasa, on one of the tributaries of the Nomo-chu, the Bar-chu.

It must be remarked here that the Ja-chu is considered as the chief branch of the Mekong, and in all probability its sources are situated much further in the interior than has been shown up to the present time on our maps. Another mistake of our maps was also discovered; it concerns the river Nak-chu, which is represented as one of the sources of the Salwen, while in reality the Nak-chu, which is known to the natives by the name of Ji-chu, and after its confluence with the Bar-chu as the Nomo-chu, is one of the chief tributaries of the upper Mekong. As to the upper Salwen, it represents, according to what I was told by the natives, an insignificant river, easily forded, the sources of which lie in the mountains, not far from the high-road to Lhasa.

From our encampment on the Bar-chu I applied to the local authorities for permission to enter the territory of Lhasa, and in expectation of the reply we stayed on the banks of this river for nearly a fortnight, completing in the mean time very successfully our collections of plants, birds, and animals. Finally we received the reply, which was negative; the authorities did not want to let us enter their territory. After having discussed our situation, I decided to change the direction

of our journey, and to proceed south-eastwards to Chamdo, or Tsamdo (a monastery situated at the confluence of the Nomo-chu with the Ja-chu), where I expected to discuss with the Chinese our chances for a further movement southwards, as also the question whether the Tibetans had the right to stop our movements in the Kam region (Eastern Tibet) when we had permission from the Tsung-li-yamen. I hoped that the higher Chinese and Tibetan authorities, whom we should find at Tsamdo, would help us in this respect. So we con-

A MONGOL OF TSAIDAM WHO WENT WITH THE EXPEDITION.

tinued our journey down the Bar-chu, and below its confluence with the Ji-chu we entered the dominions of the Se-chuan authorities. However, at the very first bridge—by means of which the road passes from the left bank of the river to the right, that is, into the dominions of Lhasa—we found a numerous military detachment of Tibetans, who declared that they were ordered not to let Europeans pass. Having no intention to fight, I continued my journey on the left bank, although the road on this bank was not so good as on the

other. I do not know how the Tibetans interpreted this second concession of ours, but I suppose they saw in it a proof of our weakness, and consequently next day, October 28 (November 10), we met on the road to Tsamdo another detachment, much more numerous than the former, and quite ready to begin fighting operations, as they were telling us that they came to drive us away, like dogs, with the fire of their rifles. There was nothing to be done but to accept the fight, and after a sharp engagement the Tibetans were thrown back and dispersed. The road was open. However, the Lhasa authorities immediately sent to us their representatives, who implored us not to enter the monastery of Tsamdo, which is one of the great sanctuaries of Tibet, the fourth in rank. I yielded to their representations. Instead of going south-east to Tsamdo, I turned east, with the intention of reaching the shores of the Blue river at its affluence with the Se-chu, at the monastery of Derghe-gonchen. The plan of exploring Tibet was thus abandoned, and after having covered some 50 miles in an eastward direction, the expedition stopped to winter in the warm wooded valley of one of the tributaries of the upper Mekong, the Ra-chu.

In the basin of the upper Mekong the plateau was still more eroded than it was further north. The expedition found here large forests of fir, and of a tree-like *Juniperus Pseudo-Sabina*, intermingled with birches, willows, wild apricots, wild apples, and a great variety of bushes. The rugged crags, covered with a rich vegetation of trees, bushes, and grasses, presented a beautiful harmony of colours. In the thickly tree-clad gorges we found quantities of the white-eared pheasants (*Crossoptilon thibetanum*), the green *Ithaginis geoffroyi*, the *Tetraophasis obscurus*, the *Tetrastes sewertzowi*, several species of woodpeckers, and a great quantity of smaller Passerine birds. During warm and bright days the naturalist, and in fact every person not insensible to the beauties of nature, could reap enjoyment both with eyes and ears. Flocks of pheasants walked about the little meadows, the eagles described their curves on the blue sky, and from the thickest of bushes, richly coloured by sun's rays, the songs of thousands of small birds could be heard. Of mammals which we did not see previously, we found monkeys, which were living in large and small colonies—very often in close neighbourhood to the Tibetans. Our hunting excursions after these interesting animals were successful, and enabled us to complete our collection with beautiful specimens of both males and females.

While wintering in this beautiful corner, we carried on our usual work. We made meteorological observations at a small meteorological station which we had established here, as also on the slope of the mountain, by the side of a small house where I was making astronomical observations. My men spent their time in hunting and in

collecting seeds of the wild grasses and berries, as also all sorts of materials concerning the history and ethnography of the Tibetans. My comrade Kaznakoff, together with Ladyghin, also undertook excursions up the Ja-chu, and eastwards, as far as the monastery Derghe-gonchen. This last journey was accomplished very successfully in a short time, although my comrade had to pass localities the population of which was anything but sympathetic to us. I must also say a few words about the men with whom we so often stood at times in friendly and at times in hostile relations.

The population of this region is divided into the settled, *Iba*, and the nomad, *Bok-pa*. The former have their houses and farms in the valleys and gorges, where the warm climate permits them to grow

BEGGARS IN KAM.

cereals up to an altitude of 12,000 feet. The others pitch their black tents in the region of the alpine meadows, the upper limits of which lie some 3500 feet higher than the upper limits of the agricultural zone. About these nomads I will not speak, because they have been well depicted already by Prjevalsky. As to the settled population, their mode of living is much better than that of the nomads. They make their houses of thin logs, or of wickerwork, which is covered with a thick layer of clay. These houses usually have two and three storeys. The lower one is used for the cattle, while the second and third are used either by the inhabitants themselves or for storing their grain, their straw, and their hay, and also the domestic utensils. The threshing-ground is usually made on the roof of the first storey, and the corn is threshed by means of a flail similar to ours.

The dress of both men and women consists in the winter of a sheepskin, and in the summer of a sort of woollen dressing-gown. The latter, however, is only worn by the richer folk. The skirt of the sheepskin is usually tacked high so as to make round the body a sort of sack, into which the Tibetan puts his cup, his oil, his tobacco, and so on. Of course, the sack is filled with all sorts of things on a journey. Then above the sheepskin, which I must say is usually worn without any underclothing, is worn a broad felt mantle. Trousers are seldom worn by men, and are quite unknown to women. As to the head-dress, it consists of a felt hat, or of a red scarf, which is wound around the head like a turban. The women decorate their heads with a string of big pieces of amber, similar pieces, as well as shells and discs of silver and white copper, being attached also to the dresses. The dirty hands of both men and women are covered with silver rings and bracelets, and in one ear they wear large-sized earrings. Their boots are made of woollen cloth of different colours. As the Tibetans never wash themselves, and always live in great dirt, almost never taking off their sheepskins, they diffuse an abominable odour.

They practise polyandry, several brothers often taking one wife. It also happens that after the death of his first wife, the father will marry the same woman to whom his elder sons are married. It seldom happens that a rich Tibetan has two wives. Good-looking women are very rare, and then only among the younger ones.

The winter in this locality is extremely mild. There is rarely snow, and the atmosphere remains transparent and dry. There is usually no wind at night or in the morning, but it systematically began to blow every day after midday from west-south-west. We had bright weather at the end of November and during all the month of December. January was rather cloudy, but in February the cloudiness began again to diminish. The lowest temperature which we observed was during the night of January 5–6 (18–19), when the thermometer fell to $-26\frac{1}{2}^{\circ}$ Centigrade. In December, at one o'clock, the mercury fell below the freezing-point only four times. The same was also in January, the lowest temperature at 1 p.m. being $-4{\cdot}8^{\circ}$ C., which temperature we had after the above-mentioned low minimum during the night.

There was no ice at all on the river Ra-chu, but its tributaries, small streamlets, were quite solidified by the ice, although at midday in the sun's rays ice was thawing even during the coldest part of the year. Snow fell very seldom, and thawed as it fell or disappeared next day. In short, the southern slopes of the mountains were always free from snow, and only thin layers of it appeared on the northern slopes, as well as in the higher parts of the mountains. After each snowfall, the atmosphere, which was always very clear, became

still clearer, and the sky assumed a deep blue colour, especially before sunset.

In February the temperature began rapidly to rise, the mountain streamlets began to roar, the birds began to mate, the eagles began to rise to tremendous heights and send forth their love-calls—in short, winter was over. I now decided to move eastwards, and to pass through the districts of Derghe-gonchen and Khor, and, after having explored them, to move up the Ya-lun-tsian, and then to the lakes of the upper Hoang-Ho, and next to Tsaidam.

Leaving the warm valley of the Ra-chu, we had once more to cross the cold plateau, as also the water-dividing range between the Mekong and the Blue river, of which the pass reached 16,000 feet, and was covered with snow.* Here, on the banks of the Blue river, which flows at an altitude of about 10,500 feet above sea-level, it was also very warm, and we saw already the first appearance of spring vegetation; the *Gentiana squarrosa* was in bloom, as also the buttercups, the dandelions, and so on. All sorts of insects and butterflies flew about. We also noticed the bank swallow (*Cotile riparia*). The Tibetans were busy in tilling the soil, and some of them had already begun sowing wheat and barley, while on the best fields we saw the first seedlings of wheat piercing the ground.

We stayed but a few days near the monastery, and resumed our journey by crossing the high chain of mountains which separates the Blue river from its left-bank tributary, the Ya-lun-tsian. We spent Easter—the last Easter during this hard but most interesting journey—at the village of Bana-jun, near the valley of the Ya-lun. We explored next the district of Khor, so far as it was possible on account of the time and the hostile attitude of the population, and I finally decided to resume our return journey. We consequently went up the Ya-lun-tsian, following its left bank, but were compelled to move rather slowly, because its banks were occasionally so steep as to compel us to go more inland. Still we progressed, and we soon had left behind

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* This part of the journey of Kozloff is extremely interesting. On his way to the Blue river, he was compelled to cross once more the nameless range of mountains which separates the Mekong from the Blue river, and by this second crossing he determined the exact position of this important orographic feature. From the accompanying map, it will be seen that there are at least three different ranges of mountains which cross this part of the Tibetan plateau in a direction from the north-west to south-east. We may thus say that in all probability, instead of the fanlike ranges of mountains which we see on our present maps, radiating between the Mekong and the Blue river and their tributaries, under the 27th and 28th degrees of latitude, we have the same plateau, with ranges running in the same north-west to south-east direction, and very probably it will be easy to connect the Himalaya escarpment of the high plateau of East Asia with the Khingan escarpment of the lower terraces of the same plateau.—P. A. Kr.

the zone of cereal culture, and entered the regions occupied by nomads only.

Owing to close intercourse with the robber bands of the N'Goloks, the local nomads, Ja-chu-ka-va, have become as bad as their neighbours. Especially one of their *hoshuns*, Lin-gu-ze, which does not recognize its submission to the Chinese, and also does not recognize the supremacy of the N'Goloks, is renowned for its wild robber instincts. With these robbers we had a serious conflict. Happily enough, our guides and carriers from the *hoshun* of Dunza, who are as much robbers as the former, seeing that we were always ready to repulse an attack, found it more profitable to bring us peacefully across their territory, but they warned us that we should be attacked in the *hoshun* of Lin-gu-ze. Their prediction was fulfilled. On the morning of April 25, on one of the numerous mountain passes of the basin of the Ya-lun-tsian (or, as it is named by the Tibetans, the Ja-chu), namely, the pass Bi-mu-la, the Lin people numbering several hundred men and occupying several mountain summits attacked us. As soon as our vanguard, which consisted of Kaznakoff, myself, and the Cossack Badmajapoff, appeared on this ground, they opened a sharp cross-fire from their matchlock guns. We had already noticed them for some time since, and consequently had settled our plan of action.

From time to time we advanced slowly forward, sitting down for awhile and shooting at the robbers. It must be remarked that we had to fight at an altitude of 15,000 feet above sea-level, where the rarefied air rendered us uncomfortable, notwithstanding our experience of such altitudes. As our caravan approached the summit of the pass, and as more men from it came to reinforce us in the vanguard, the shooting of the robbers became slower, and after an hour's time we had reached the head of the pass and cleared it entirely. The robbers were running away southward, to the Ya-lun-tsian. We quietly took our breakfast at the top of the pass, where we found considerable quantities of ice and fuel, prepared by the robbers while they lie in ambush, and then we began to descend on the other side of the pass, sending out our scouts in different directions. At a spot where the main gorge meets a side gorge coming from the left, the robbers, having received reinforcements of another hundred men, had taken their position with the intention of attacking us at the same time from two sides. Besides, part of them were standing upon the rocks on the sides of the narrow gorge ready to roll big stones down the mountain, so as to produce a panic in our caravan. Happily enough, this ambush was discovered in time by our scouts. So I sent six of our men to drive away the Tanguts, and myself continued to move slowly down the main gorge. The robbers did not expect an attack, and after a few shots from our scouts ran away, meeting, instead

of us, their own comrades, who had been taken by panic and were in full flight. Our main body did not pursue them, because just at this moment came several lamas to offer to conclude an armistice. After having settled the general conditions, I ordered one of the lamas immediately to gallop full speed after the runaways, and to order them never to appear more with their arms in the way of our expedition. This promise was strictly kept, and so we passed without any difficulty, although the robbers had intended to lay for us a third ambush.

After that, our expedition continued its journey without any other difficulty. Moving slowly north-westwards, towards Lake Russian,

SMALL TOWN, KUAN-GO-CHEN, IN THE HAN-SU PROVINCE, NEVER BEFORE VISITED BY A EUROPEAN.

we soon met a few natives, Ja-chu-ka-va, who knew the upper course of the Yellow river, and a few days later we met an old Tangut who knew Lake Russian, and who undertook for a good remuneration to be our guide. Guided by this old man and his three younger comrades, we crossed the most interesting localities of the basin of the Yellow and the Blue rivers; and on May 30 (June 12, N.S.), from the top of a pass, we made out the blue shining surface of Lake Russian. Nearly a year before we had left it from its western extremity. Now we had under our feet its south-eastern shore. In one or two hours' time we had reached it, and had our bivouac close by its waters. An excellent road runs along the eastern coast of the Orin-nor, and after a two days' march we reached our old encampment at the issue of the Hoang-ho

from the lake. Here I concluded the survey which I had made throughout our journey in Tibet.

The remainder of our journey to Tsaidam I shall not describe, because we went along a well-known road. Our comrade, Ivanoff, who had been left in charge of the meteorological station, met us in the valley of the Alyk-norin-gol. I had sent him notice by one of the Tsaidam Mongols, asking him to meet us on our journey, and to bring the letters which might have been received from Russia. We were delighted to find that everything in Tsaidam was in excellent condition. The very same day as we came thither we met also a Chinese interpreter, who had been sent by the Governor of Sinin to meet the expedition, and to bring it a bulky mail from Russia.

After having stayed during the hot season in Eastern Tsaidam in the mountains, we resumed our return journey on August 1 (14), and four months later reached the frontiers of our fatherland. Even this stay in Tsaidam was not lost, because we made frequent excursions in the mountains and completed our collections; but during one of these excursions we nearly lost one of our young men, Madaeff, at whom Tangut robbers had fired from an ambush. While I remained at the meteorological station, making astronomical observations, and bringing everything in order for the future journey, Ladyghin made an excursion for the exploration of the lakes Taso-nor and Kuzlyk-nor in Northern Tsaidam.

I will complete this short report on the work of the expedition by the following letter which I had sent from the extremity of the Eastern Altai to the Russian Geographical Society:—

"As you know already from my previous report, the expedition left Tsaidam at the beginning of August. The weather continued, however, to be hot, and, owing to heat, as also the horse-flies and the mosquitoes, we lost fifteen of our best camels, out of our herd of fifty head, so that we had to buy camels on the way from the natives. I made, with Ladyghin and two Cossacks, a side excursion to Sinin, while the main body of the caravan, under A. N. Kaznakoff, went along the straight route to the Cheibsen monastery. I considered it my duty to personally thank the Tsin-tsai-yu for all he had done to facilitate our sojourn in the Kam region. From our conversations with him, we learned that there was great anxiety in Russia about our expedition. 'I have received three telegrams from Pekin about you,' he said, 'each one even more anxious than the former; but I knew myself nothing about you.' . . . The good functionary took great interest in the Kam region and its inhabitants, and advised me not to go so far another time, and to avoid regions peopled with robbers. As to the Governor (Dao-tai) of Sinin, who had spent a long time in the Ili region, and knew there the late V. M. Uspensky, he, on the contrary, took great interest in knowing how much of the region remained unmapped, whether we had made good collections, and so on.

"From Cheibsen we travelled along the same old route, of which I now made a survey. Continual rains which we experienced in the province of Han-su did not permit us to make many excursions in the mountains, which are so rich in vegetable and animal life. Our thoughts were also chiefly directed towards preserving the treasures which we had accumulated in Tibet, and we were quite happy to find that everything we had left with the lamas at the Chorten-tan monastery was in perfect order, and that the lamas welcomed us back so cordially.

ONE OF THE GORGES OF THE UPPER MEKONG.

"We did not stay long at Chorten-tan, as we were in a hurry to cross the Gobi before the beginning of the great colds (the frosts already reached $-20°$ C.). After having crossed the Chagryn steppe, we came to one of the most miserable Chinese towns, Kuang-go-chen, which had never been visited before by Europeans, but the authorities of which had already been warned of our arrival by the amiable Tsin-tai of Sinin. These authorities, as well as the Van of Alashan, helped us in crossing the Gobi. In short, on this return journey, as well as on our out journey, we met with no difficulties. We even chose this time a

new direction, and thus made a fourth traverse of the Gobi, between the eastern route which Prjevalsky had followed so many times and the route I had followed two years ago in the western portion of the desert. Here also, in proportion as we moved north, we saw that the country lost its character of a plain, and was intersected with ranges of hills and hillocks. We also considerably increased our geological collections, as, being on our way home, we could better follow the instructions which had been given to us by V. A. Obrucheff.

"Soon after we had left the residence of the Alashan prince, we were overtaken by a Tarancha from Jarkent, who had been sent by the Russian consul at Urumchi in search of our expedition; and it was only then that I understood the anxious telegrams of which I had been told at Sinin. We also learnt that here, too, in Mongolia, a Mongol and a Russian were vainly trying to get news from the expedition. We, too, were extremely anxious to get some news from home."

On November 22, 1901 (December 5), we were at last at Kiakhta, and in January following I was at St. Petersburg.

In conclusion, I will permit myself to enumerate the main results of the expedition. We have thoroughly explored the Chinese or Mongolian Altai, the Central Gobi, and that portion of Inner Tibet which is known as "Kam." The Altai has been explored all along its northern and southern foot, and has been crossed several times. The desert of the Gobi was crossed along four different routes in the winter —provisions of ice or snow being taken during these crossings. In Eastern Tsaidam, at the northern foot of Tibet, a depôt of the collections and the provisions was organized, and the camels were left, the journey in Tibet being only possible with oxen. At this depôt a meteorological station was organized, as had been recommended by the late General Tillo. Four men, under Sergeant Ivanoff, were left at the station, and the conduct of the meteorological observations was left to Muravioff, who had received the necessary preliminary training. The Tsaidam meteorological station has thus worked for fifteen months without interruption, the records of the instruments being taken thrice a day, and once every three months every hour for twenty-four hours in succession. This was the first time that such work was done in Central Asia, and the observations of the Tsaidam station will give a solid basis for calculating our altitudes in Tibet. It was also the first time that a canvas boat was used for the exploration of lakes in Central Asia—their depths and their flora and fauna.

We also used during this expedition, more frequently than before, the system of sending out separate excursions, which were made by my comrades Kaznakoff and Ladyghin, while I journeyed with the main body of the caravan. Owing to this system, we were enabled considerably to increase the domain of our exploration, as also the value of our collections.

We brought back with us—(1) about 8000 miles of survey; (2) the positions of forty localities determined astronomically; (3) geographical, historical, and ethnographical, as also commercial information about the regions visited; (4) more than 400 photographs; (5) meteorological observations which were made regularly every day; (6) and rich natural history collections—that is, about 1200 geological specimens; nearly 1400 species of plants (over 30,000 specimens); and the following zoological specimens: 300 skins of mammals, 10 skeletons, 1500 birds, 500 fishes and reptiles, and 30,000 insects. All these collections have already reached St. Petersburg in good order, have been arranged, and are already in the hands of specialists and different scientific bodies.

TRAVEL AND TRADE ROUTES IN NORTH-EASTERN RHODESIA AND ADJACENT PARTS OF EAST CENTRAL AFRICA.

Our knowledge of the geography of North-Eastern Rhodesia has received considerable additions within the past few years from the journeys of members of the administration, who, in the course of their official duties, have had occasion to travel by new routes through some of the less-known parts of the territory. Through the courtesy of Mr. Robert Codrington we are enabled to give accounts of two such journeys through the region lying between the Loangwa and the Kafue, while Mr. Codrington himself sends us the account of a recent voyage on Lake Tanganyika, with instructive remarks on the present state and prospects of European enterprise on the lake and in neighbouring regions. Much activity has also been displayed by the French missionaries known as the "Pères Blancs d'Alger," who within the past three years have established themselves in the Awemba country, and have in some cases made good use of the opportunities afforded them of adding to our knowledge of the country. Some of the results of their journeys have kindly been placed at our disposal, and of these we hope shortly to give a summary. In the present number we confine ourselves to the work of British officials.

I. A VOYAGE ON LAKE TANGANYIKA.

By ROBERT CODRINGTON.

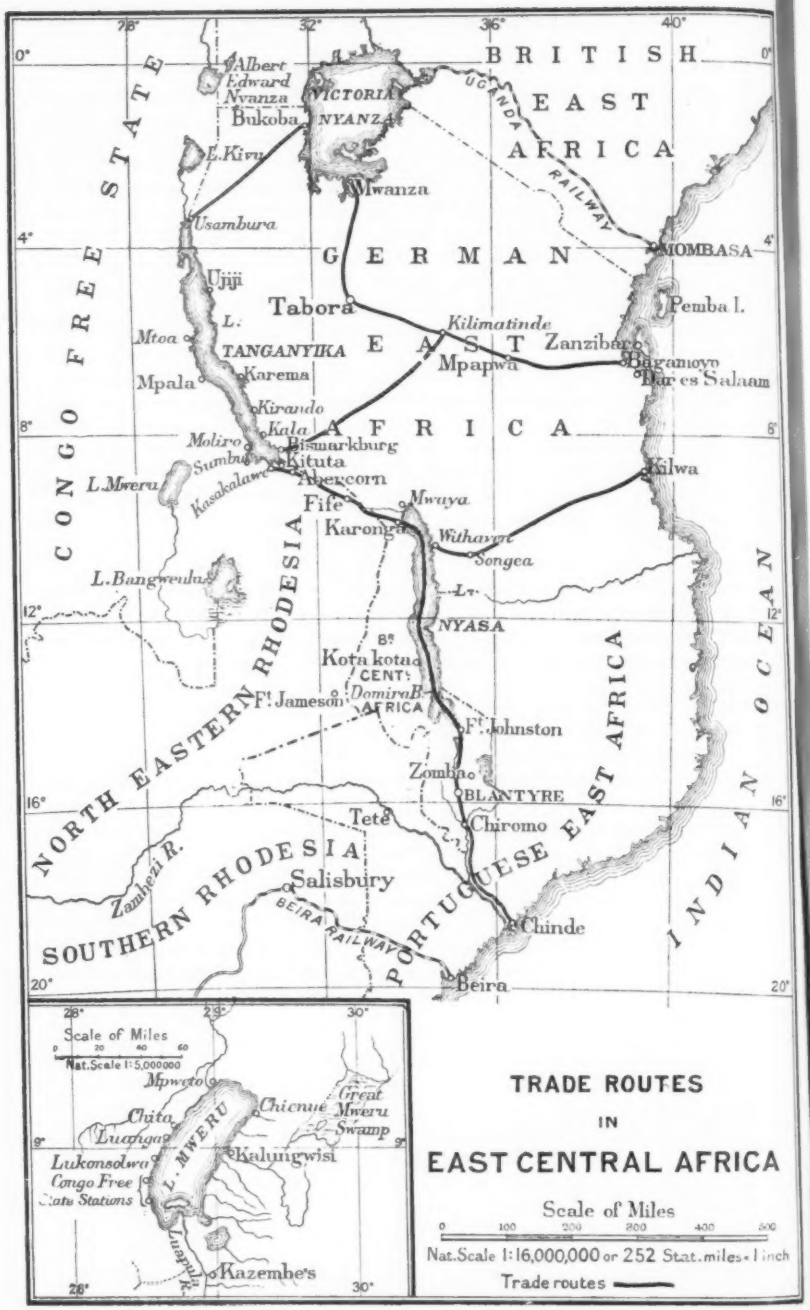
In June, 1901, Mr. Codrington embarked at Kituta on the German Government steamer *Hedwig von Wissmann* (*Journal*, vol. xvii. p. 430), which, like her sister-ship on Lake Nyasa, earns money by carriage of freight and passengers, besides being available for Government purposes. She carries a 4-centimetre quick-firing Krupp gun, and has a speed of 8 to 10 knots and a cargo capacity of thirty to forty tons. The first point touched at was the German military port of Bismarckburg—the headquarters of the "bezirk" of Ukonongo. There are eighteen European residents and a native garrison of ten Sudanese and a hundred locally

enlisted troops, while some fine buildings are in course of erection. The harbour, however, is not good, but a little further up the coast is the large land-locked, harbour which has been named Wissmannhaven. Kala, the southernmost of the mission stations of the Pères Blancs d'Alger on Tanganyika, is next reached. Both here and at Kirando, situated in an exceptionally fine bay reached by four hours' steaming from Kala, good and substantial buildings have been erected. The church at Kirando is large and contains beautiful wood-carving. At Utinta, reached on June 5, there is a good harbour, and as the telegraph-line passes 10 miles inland, a depôt for the reception of material has been formed in the bay. There is also a station of the Pères Blancs. The most important mission station on the east coast of Tanganyika is at Karema, which is the residence of the bishop. It has no harbour, however, and is often inaccessible, especially during a south wind.

Ujiji was reached on June 7, after nineteen hours' steaming from Karema. The native town, with its ten thousand inhabitants, covers an enormous area, well shaded by mango trees, bananas, and palms; but most of the houses are mere hovels, and the whole place reeks with dirt and disease. The principal Arab, Sefi bin Rashid, who has been appointed Wali by the Government, lives in a good double-storied house, and entertained his visitors with champagne and coffee. There are about sixty Arabs and thirty Banyans (British subjects), while the Europeans number eight, including two Greeks who have a large store. The fort is well placed and substantially built, but the garrison is very small, the troops of the "bezirk" being distributed over a large area. There is no harbour at Ujiji, and steamers usually anchor in Kajoma bay, some 7 miles north, whither the Government station will probably be transferred shortly. The survey of the Transcontinental Telegraph is already completed to Ujiji, which will be connected with the main line by a branch of 13 miles, and is being extended to Kajoma. Every assistance has been given by the German officials on Tanganyika, and it is confidently expected that the line will be open to Ujiji during 1902.

From Ujiji the voyage was continued to Usambura, 6 miles from the mouth of the Rusizi, a German station with a white population of seven, communicating in two days with the important post on Lake Kivu. It seems a foregone conclusion that the labours of the commission now at work will result in the selection of the Rusizi river as the boundary between Germany and Congo State territory in this region. At the time of Mr. Codrington's visit an expedition was despatched against the Congo rebels, who were causing trouble in German territory. They are well armed and bold, and neither the Belgians nor Germans have a sufficient force to deal decisively with them, though the Germans have recently disarmed over a thousand of them, whom they have supplied with seed-corn and settled down in the Ujiji district. On the German coast of Tanganyika troubles with the natives seem rather due to their failure to pay taxes than to actual hostility towards Europeans, and the telegraph surveyors have never been hindered or molested by them.

On June 12 the lake was crossed to the Congo Free State station of Uvira, where there is a garrison of three officers and three hundred native soldiers. A further passage of twenty-three hours brought the steamer to Mtoa (Towa), or Albertville, the principal Congo State station on the lake. Mpala was reached hence by nine hours' steaming, and St. Louis, the port for Baudoinville, by another two. Mpala and Baudoinville are stations of the Pères Blancs, the latter being the residence of the bishop, who is Vicaire Apostolique du Haut Congo. Twenty-six missionaries, including eight sisters, are distributed between the two stations, and the churches are very large and magnificent. Mvua and Moliro, the latter just


BRITISH EAST AFRICA
GERMAN EAST AFRICA
CONGO FREE STATE
NORTH EASTERN RHODESIA
SOUTHERN RHODESIA
PORTUGUESE EAST AFRICA
INDIAN OCEAN
NYASA
TANGANYIKA
Albert Edward Nyanza
VICTORIA NYANZA
Bukoba
L. Kivu
Usambura
Mwanza
Ujiji
Tabora
L.
Mtoa
Mpala
Karema
Kirando
Kala
Moliro
Sumbu
Bismarckburg
Kituta
Abercorn
L. Mweru
Kasakalawe
Fife
Mwaya
Karonga
Kilimatinde
Mpapwa
Zanzibar
Bagamoyo
Dar es Salaam
Pemba I.
MOMBASA
Kilwa
Witharye
Songea
L. Bangweulu
L.
Kota kota
CENT: AFRICA
Domira B.
Ft. Jameson
Ft. Johnston
Zomba
BLANTYRE
Tete
Chromo
Salisbury
Zambezi R.
BEIRA RAILWAY
Chinde
Beira
UGANDA RAILWAY
Scale of Miles
Nat. Scale 1:5,000,000
Mpweto
Chita
Luapula
Chicnue
Great Mweru Swamp
L. MWERU
Lukonsolwa
Congo Free State Stations
Kalungwisi
Luapula R.
Kazembe's
TRADE ROUTES
IN
EAST CENTRAL AFRICA
Scale of Miles
0 100 200 300 400 500
Nat. Scale 1:16,000,000 or 252 Stat. miles = 1 inch
Trade routes

within the Congo State boundary, are miserable places; but Sumbu, the British port on Cameron bay, is a well-built station, second to none on the lake. Through it passes most of the trade for Lake Mweru, around which lake there are now living some forty-five Europeans. A small township has been laid out at Sumbu, and another is springing up at Kasakalawe, considered to be the best port at the south end of the lake. It has been adopted by both the Tanganyika Concessions Company and the African International Flotilla and Transport Company, and is pleasantly situated, sheltered by forest trees from the heat and glare of the beach. The anchorage is satisfactory, and in case of a strong wind from the north, perfect shelter is available opposite at Niamkolo.

The vessels now plying on Tanganyika are—the "Tanganyika Concessions" steamer *Cecil Rhodes* (twin screw), with a carrying capacity of from thirty to forty tons; the German *Hedwig von Wissmann*, with about an equal capacity; the African Lakes Corporation's steamer *Good News*, with a carrying capacity of twenty tons; the Katanga Company's steamer, with a carrying capacity of from thirty to forty tons; and the Congo Free State schooner, carrying about one hundred tons. Some five or six dhows, the property of Arab and Greek traders, compete in a small way with the European-built vessels. The lake, though said to be more stormy than Nyasa, is considered a safe waterway by the skippers of the vessels, no dangerous rocks being reported. The level of the lake in June, 1901, was 4 or 5 feet higher than in the corresponding month of 1900, the Lukuga outlet having again silted up.

The German firms at Bagamoyo and Dar-es-Salaam have withdrawn their European agents from Tanganyika, owing to losses through giving credit to Arabs and natives; and what small trade there is on the German coast is in the hands of the Greeks, Arabs, and Banyans. The Banyans buy their goods in India, and transport them cheaply by means of dhows to the African coast, so that they are able to compete with the Greeks and Arabs, who buy in a dearer market at Bagamoyo. Minerals have not yet been proved to exist in the German territory, and rubber has been worked out in the neighbourhood of the lake, though abundant and untouched in large areas inland. Coffee and wheat, palm oil, and salt are at present produced for local consumption only, but the salt may become more largely marketable. The enormous labour-supply should render the development of the German sphere somewhat easier than that of the British sphere adjoining, but the unreasonably high rate of pay fixed by the German Government is unfortunately calculated to strangle any young industry. At Bismarckburg the rate is 8 rupees a month—more than double the rate in the British sphere.

There is no trade, properly so called, on the Congo coast of Tanganyika, but all rubber and ivory is regarded as the property of the State, and has to be surrendered by the natives in fixed quantities annually. The natives are, however, continually in rebellion, and the country is unsafe except in the immediate vicinity of the military garrisons, and within the sphere of influence of the missionaries.

Of the three trading firms established on the British coast, the African Lakes Corporation alone transacts any considerable business, its well-organized and equipped transport route from Chinde to Tanganyika placing it in a favourable position to secure nearly the whole trade of the Tanganyika and Mweru regions. On the shores of the latter several small European posts are springing up. The Katanga Company ("Comité spécial de Katanga") has several stations on the Congo side, and at the four posts of Mpweto, Lukonsolwa, and the two opposite Kilwa island, there is a total of about twenty-eight Europeans. At Luanga Mission station there are about seven, and some eight or ten are distributed along the navigable portion of the Luapula. Fort Rosebery or Johnston Falls is the head-

quarters of the Native Commissioner of the Luapula Division. On the British side of Mweru are Kalungwizi, the residence of the district magistrate, and Chienji, the station of the African Lakes Corporation, where the African Transcontinental and Flotilla Company is also established. The Europeans on this coast number nine or ten.

The greater part of the rubber reported from North-Eastern Rhodesia in recent years has been obtained from the Congo side of Lake Mweru, and it is to prevent this that the Katanga Company has established its posts on the lake-shore, and built a steam-launch to patrol the lake and the Luapula. The African Lakes Corporation have also a small steam-launch, and there are three or four steel sailing-boats on the lake.

Much has been done by the Germans to open up overland routes to Tanganyika, by which supplies are now transported to Ujiji and Bismarckburg to the entire neglect of the Shire-Nyasa route. From Kilimatinde and Tabora, on the trunk road from Dar-es-Salaam to the Victoria Nyanza, roads branch out to Bismarckburg and Ujiji respectively, while from Kilwa a road runs through Songea to Withaven on Nyasa and connects by steamer with the road under construction from Mwaya to the British road between Nyasa and Tanganyika. Supplies for German Nyasaland at present go by the Shire route, but the German Government is determined to develop the overland route from Kilwa. With the completion of the Uganda railway to Victoria Nyanza another and perhaps the best route to Tanganyika will be available, there being less than 200 miles overland transport between the two lakes. The German officers on Tanganyika are confident that a railway from the coast to Tabora will be built within the next five years.

Supplies for the Congo State territory are transported both by the Congo and by the Shire route. A caravan from Tanganyika to Boma takes from two and a half to three months, and communication is often interrupted.

The British route to Tanganyika has many natural advantages, the chief being, of course, the Zambezi, Shire, and Nyasa waterways, all of which are provided with ample shipping. The only impediments in this route are comprised in the unsatisfactory overland connection between Nyasa and Tanganyika. The proposed railway between the lower and upper Shire hangs fire so long, that it appears quite possible that the idea will not be realized for many years to come. Meanwhile various improvements are being made on the road, which should shortly be available for continuous waggon-traffic. Native labour is during some months of the year very plentiful, and the transport of goods to the north end of Lake Nyasa presents very little difficulty. The so-called Stephenson road, often shown on maps as stretching from Nyasa to Tanganyika, has never actually existed, the route being simply roughly cleared for some 60 miles from Lake Nyasa. The British South Africa Company have, however, constructed a broad and well-made waggon road from the border of the British Central Africa Protectorate to the shore of Tanganyika, and across this road waggons are continually plying. From Nyasa to the border of the Chartered Company's territory it is quite impossible to make use of vehicles. The road runs up the escarpment of the Nyasa-Tanganyika plateau, ascending nearly 3000 feet in 30 miles, and would cost, probably, from £5000 to £7000 to put in a proper condition for waggon-traffic. The construction of this road is, without doubt, worthy of attention, if the Zambezi-Nyasa route to Tanganyika is to be maintained.

The following table shows cost and duration of transport to Tanganyika by various routes. Although the British route appears at present to be the best, such will not necessarily be the case in future, unless as much energy is exerted to improve it as is being put forth by the Germans on the overland route through German East Africa.

TRADE ROUTES TO TANGANYIKA.

Routes.	German Route.			British Route.		
	Period for mails.	Period for merchandise.	Cost per ton for merchandise.	Period for mails.	Period for merchandise.	Cost per ton for merchandise.
	Days.	Days.	£	Days.	Days.	£
A. Bagamoyo and Dar-es-Salaam *viâ* Tabora and Ujiji	36 to 42	60 to 70	106			
B. Chinde to Karonga	dependent upon connections			21	50	17
Karonga to Kituta				10	18	30
Kituta to Ujiji				6	6	8
				37	74	55
C. Bagamoyo and Dar-es-Salaam *viâ* Kilimatinde to Bismarckburg	30 to 40	70 to 80	106			
D. Kilwa to Wiedhafen (Lake Nyasa)	20 to 30	40 to 50	26 to 30			
Wiedhafen to Bismarckburg ...	15	20	26 to 30			
	35 to 45	60 to 70	52 to 60			
E. Chinde to Karonga	dependent upon connections			21	50	17
Karonga to Kituta				10	18	30
Kituta to Bismarckburg				1	1	2
				32	69	49

II. JOURNEY FROM DOMIRA BAY, LAKE NYASA, TO FIPE, ON THE TANGANYIKA PLATEAU.

By CHARLES McKINNON.

The voyage from Fort Johnston to Domira bay was made on January 22, 1901, by the African Transcontinental Telegraph Company's s.s. *Adventure*, formerly a gunboat, and one of the fastest and best sea-boats on Nyasa. There is a telegraph station at the bay, and a subsidiary line branches off hence to Fort Jameson. The road to the fort runs west, ascending to the Angoniland plateau on the second day and passing the Dutch mission station of Mvera with its coffee and vegetable gardens, and 15 miles further on the British post at Dowa. The elevation of the plateau, which, though it looks poor, supports a large population, is about 5000 feet. Beyond the Bua river a low ridge dividing the British Central Africa Protectorate from the Chartered Company's territory was crossed, Fort Jameson, the seat of government of North-Eastern Rhodesia, being reached on the following day. Here there are a number of good buildings erected both by the administration and by trading companies. The township is laid out in wide streets, and some thousands of shade trees have been planted, with good waggon-roads to the east, west, and south. Hence the journey was continued, with a fresh lot of carriers, in a north-westerly direction, through a sparsely populated country, the large village of Kwambiri, head of the Wabisa of these parts, being reached on the fifth day. The next day the crossing of the Rukusi, in high flood at the time, caused some delay, it being necessary to wait until the water subsided. The Loangwa was crossed in canoes on February 13.

Both banks of the Loangwa for several miles are heavily timbered with mopani forest, which seems peculiar to this valley, as it does not exist further west on any of the large rivers in British territory. The country abounds with game. Nawadia, reached on February 14, is a post of one of the native commissioners for North-Eastern Rhodesia. The house, a massive stone building, is on a kopje overlooking the Nyamadzi river, and is situated on one of the old slave routes to the interior. Two days later, Mpiga, another native commissioner's post, situated in the Awemba country 65 miles north-west of Nawadia, was reached, the Mchinga range having been climbed meanwhile. The range at this point is about 12 miles in width, very well wooded and watered, all the rivers flowing to the Loangwa. From Mpiga a visit was paid to Lujembe, the most southern of the Awembe chiefs, who, as was formerly the general practice, keeps a band composed of blind minstrels. A mission station of the Pères Blancs d'Alger, one of four built since 1899 in the Awemba country, was passed *en route*. Lujembe's is a great centre of the salt trade, as there are extensive pans close by, to which people come from long distances, paying a small tax to the chief for permission to work them. The surrounding country is called Chinama, which in the Awemba language simply means "game," to which the salt is doubtless an attraction.

At Mpiga's the Angoni carriers—who had proved a superior lot of men—were sent back, and other carriers engaged without difficulty. A march of 45 miles north and north-east led to the Karungu river, where is an Administration rest-house and a large native village. Two more days brought the party to the Chambezi, which, where crossed, is narrow with high banks, and is deep and sluggish. Below, rapids occur, obstructing an otherwise important waterway. The river was crossed in canoes, and the march continued in a north-easterly direction along the banks of the Rukuru—one of the largest tributaries—to Kasama, the principal Administration post in the Awemba country. It stands on a high ridge overlooking the Chambezi valley, and round it quite an important little township is springing up, several stores being in course of erection. Not far off is the Likabula station of the Pères Blancs d'Alger, who, during the two years since Europeans were admitted into the country, have shown great energy and enterprise, having already built double-storied brick dwelling-houses and a large church, using for the roofs of the buildings a kind of slate (schist) found in the vicinity. From Kasama the route led across some flooded country to the village of Kitiamkula—nineteenth king of the Awemba—who gave a hearty welcome to the traveller.

The present Kitiamkula's full name is Mkuta Chikuta Mwaswe. He distinctly remembers Livingstone, who visited Chitapangwa, the Kitiamkula of that day, and the seventeenth king, going on from his village to Mwamba's. Chitapangwa's village was situated close to the site of the first Administration post of Kasama. Some six years ago the predecessor of the present chief, Sampa Kitiamkula the eighteenth, died, whereupon Mwamba, his most powerful vassal, tried to make himself king, ejecting by force the high priest, by whom his pretensions were opposed. The latter was, however, supported by Mr. Young, the native commissioner, by whose help he regained possession of the "god," or idol, without which no claim to the priesthood could be valid, and shortly afterwards the present Kitiamkula was made king. Muruli, where the high priest lives, is the burial-ground of all Awemba belonging to the ruling family, the place of sepulture being apparently a shallow pit encircled by a fence of palm trees in a clump of virgin forest. When Mwamba died, the Administration refused to allow the usual human sacrifices to take place, while, by the custom of the tribe, his successor could exercise no authority until the funeral rites had been performed. Matters remained

at a deadlock for two years, after which time the people at length yielded, and quietly buried the remains. The "god"—apparently an idol of some sort—is kept at Mruli in the inner of two houses, one within the other, the outer of which is crammed with antelope-horns. There is another hut at a little distance, in which food is placed daily by the "god's wife," who is the widow of a former king, and who is the only person besides the high priest allowed to enter either of the huts. In fact, none of the Awemba will enter the stockade of Muruli unless bidden by the priest.

A day's march from Kitiamkula's, the Chambezi, now in high flood, was crossed by means of one small canoe, and after passing Kayambi, another mission station of the Pères Blancs, the caravan crossed the Chozi, a fair-sized river once supposed to be one with the Chambezi.* Two days later Fife was reached, a journey of over 600 miles having been completed in fifty days, at the worst time of the year, without any detriment to health, in spite of the constant wettings experienced.

III. JOURNEY TO THE KAFUE AND ZUMBO DISTRICTS.†

By P. H. SELBY.

The journey was commenced from Fort Jameson on May 11, 1901, the route leading *viâ* Sassare (where a recently discovered gold-reef is being worked with success) to Hargreaves, a station of the North Charterland Exploration Company on the Loangwa. Beyond this river the track rises 2000 feet in the first 21 miles, crossing the Kwessi or Ngoza range before descending into the flat well-watered valley of the Lukashashi and its tributaries. A comparatively sharp ascent of 1500 feet next leads to the south-eastern edge of the Mchinga plateau, over which the route passes through 40 miles of fertile bush country to the Mkushi river station, situated on a healthy site 3738 feet above sea-level. The Mkushi is a clear swift-flowing perennial stream some 20 yards in width. The district is sparsely populated by Walala, a nomadic tribe who have been accustomed to shift their wretched huts every year, but who will probably settle down more permanently now that they are secured from raids by the establishment of a Government station. A narrow road is being hoed from Mkushi to connect with the Fort Jameson-Hargreaves road, and a track has been made to Serenji.

The path from Mkushi to Kapopo station—140 miles further west—crosses, halfway, the watershed between the streams flowing south and south-east to the Lunfsewa, and those flowing north and north-west to the Kafue or Kavu, the district inhabited by the Walamba tribe being then entered. The tributaries of the Kavu flow slowly in beds cut through deep rich black soil, their banks being fringed with larger and thicker timber than is found further east, the aspect of the country becoming distinctly more tropical as one goes west. The Landolphia vine is here abundant, as well as the cotton plant, much cultivated before the advent of European and Indian calicoes. Near the Kapopo station, which has been built close to the Linyama stream, the natives are of many different tribes, the Wabwera being apparently most amenable to civilizing influences, though all resent the stoppage of the former lucrative trade in slaves and ivory with the Mambunda from the west. It is fortunate that the comparative sparseness of the population has saved from destruction the grand clumps of virgin bush with their wealth of

* The Chambezi and Chozi are shown in their correct relations in the map accompanying Mr. Wallace's paper in the *Journal* for June, 1899.

† Map, p. 668.

rubber vines, which elsewhere have been sacrificed to the primitive methods of cultivation. Limestone of great richness underlies the whole surrounding country.

The journey was continued on June 14 for Chepepo. After the first 20 miles the aspect of the country gradually changes, the dark rich soil, high grass, and timber giving place to ground of far less fertility and scrub bush. Thirty-five miles in a south-south-westerly direction led to the Lukanga river, here fully a mile wide, but blocked with papyrus and aquatic plants, the ford being extremely treacherous and difficult, with depths in places of from 4 to 12 feet. On the south side the country is desolate in the extreme, being absolutely flat and swampy, with only a few sparse clumps of low scrub. The chief Chepepo, acknowledged as chief by a considerable portion of the Walenji, is an intelligent man. As a south-west course would have led across the great Lunjofwa swamp, guides were obtained for the Kavu river, the Lukanga being again crossed some 12 miles west of the ford above mentioned. It was here some 70 yards wide and very deep, but with no perceptible current. The northern bank is bounded by swamps for a distance of 6 miles, beyond which soft white sandy soil with thin bush appears. After a march of 20 miles south-west through country of this description, the huge swamps of the Kavu were reached, and camp was pitched on the east bank on June 20. The Kavu was here some 200 yards wide, deep, with a slow current, the swamps extending along both banks. The Lukanga was again struck near its junction with the Kavu, and crossed in canoes. The dreary flats now gave place to slightly undulating ridges of bush, on the crest of one of which Kasonkamola, the paramount chief or the Walenji, is settled. Traders do not give him a good reputation, but, though at first suspicious and reserved, he soon thawed, and allowed his people to bring in food. Fourteen miles further on, the village of Sitanda,* a pleasant-faced, light-coloured native, who shares with Kasonkamola the control of a large portion of the Walenji tribe, was reached, the intervening country being extremely fertile and well peopled. One of Sitanda's sons and some other relatives accepted with alacrity an invitation to visit Fort Jameson.

From Sitanda's the return journey *viâ* the junction of the Loangwa and Zambezi was commenced, a divergence from the direct route being made for the purpose of visiting Longo's village on the southern border of the great Lunjofwa swamp. Thence an easterly course was followed to Shuiyungi's, after which a march of 30 miles through broken, fertile, well-watered country led to the edge of the Mchinga plateau, a descent being made by a steep and tortuous path into the Mlungushi valley, thickly peopled with Aluano. In 3 miles a drop of 2400 feet was registered by aneroid. The Aluano are short, but powerfully built, somewhat repulsive in appearance, and dwell in poorly built and extremely dirty villages. They raise immense crops of "Mapira" along the beds of watercourses. The valley was traversed for three days in a south-easterly direction, the path winding among stony and rugged hills. Afterwards it ascended the Pembeni range to a height of 3400 feet, and for 35 miles followed the highest ridges of this chain through an uninhabited and poorly watered tract. A descent was then made into the valley of the Pochera, a large affluent of the Rufunsa, by the valley of which last the junction of the Loangwa with the Zambezi was reached on July 11. The point of British territory at the junction known as Feira, was once the site of a Portuguese settlement, and the sandstone from its ruins is being used in the construction of the present Administration station. This is being built on a small hill rising vertically 200 feet from the Zambezi, the land below being well suited for the laying out of a small township. The country around is moderately well peopled with Chikunda.

* Sitanda's village was Mr. Selous's terminus in 1878.

The Zambezi is here about 550 yards wide, running fast and deep. The Loangwa widens at the junction to about 1000 yards, the permanent channel skirting the stony point on the British side. For about half a mile up it is fairly deep, but beyond that distance the water reached at the time only to the knees. Near the junction the banks of both rivers are well suited for the discharge of cargo from steamers and barges. The small Portuguese town of Zumbo lies under a high peak of the Madzanswa range, about 2½ miles due east of Feira.

Starting again on July 18, the expedition proceeded for 50 miles up the west bank of the Loangwa to Almoso's village, at which point the river divides into three channels, to unite again 10 miles lower. Water existed in July in the easternmost of these only, and even this was so narrow, tortuous, and broken by rocky rapids as to probably place the limit of navigation by steamer, even in the wet season, below the union of the three channels. Waggon transport from Feira to this point would be easy during the dry season, but at Almoso's the road enters hilly ground, and a considerable expenditure would be necessary before it could be used for wheeled traffic. The Loangwa was now crossed, and the valley of the Mezi—at present taken by the Portuguese as their northern boundary—ascended to the Senga plateau, on which are numerous settlements of former slaves of the Angoni. Fort Jameson was reached on July 30, thirteen days after Feira had been left. The accompanying map is based on observations by prismatic compass.

PROF. GREGORY'S EXPEDITION TO LAKE EYRE.

The chief scientific results of his recent expedition to the Lake Eyre basin were sketched by Prof. Gregory in an article contributed to the Melbourne *Age* for February 22 last, of which the following is a condensed summary. Prof. Gregory began by pointing out the great importance of the part played by Lake Eyre in the physical history of Australia, which is such that the lake may fairly be termed the geographical centre of the continent. Not only was it once the great distributing centre, but it is involved in each of the four main geological features of Central Australia, viz. the great artesian basin of Queensland; the ancient plateau of Western Australia; the great valley of South Australia; and the lake plain which extends eastward to the Darling. Nor is it of less importance as regards the zoology, botany, and anthropology of the surrounding region.

Lake Eyre is, however, now but the dead heart of Australia. It absorbs the drainage of 500,000 square miles of country, passing on none of its water to areas which might make more use of it. Animals and plants are continuously migrating into its basin from the surrounding highlands, but are unable to make good the internal waste. The desert itself produces nothing new, and its plants and animals are few and stunted, barrenness and inertia being the leading characteristics of a region once fertile and creative. The reasons for this change are to be sought in the geological history of the Lake Eyre basin, of which Prof. Gregory gives an outline from the time when the coalfields were being

formed in Gippsland. The region was then slowly sinking beneath an encroaching sea, which eventually advanced from the gulf of Carpentaria as far south as the northern end of Lake Torrens and extended east to the coast ranges of Queensland. After its retreat, and the formation, on dry land, of the "Desert sandstone" above the blue clays that had been deposited on its floor, a great uplift occurred along the Queensland hills, and the streams which descended from these on the west plunged under the blue shales and accumulated as the great artesian reservoir of Central Australia. After this came a great series of Earth-movements, which impressed on South Australia its main existing geographical features, including the great valley of Spencer gulf and Lake Torrens, and the mountain system which runs obliquely, north-westward, from the Flinders to the Denison range, damming back the artesian waters.

About the same time the Lake Eyre country began to sink, and this movement lasted until, as at present, the lake margin was 39 feet below sea-level. The drainage system was thus disturbed, and the streams which had before probably flowed south-eastward, to the Darling or to an arm of the sea occupying the present Murray valley, were now diverted to this central basin, where they accumulated as a vast inland sea. The rainfall was considerable, and the surrounding steppes were probably well grassed and fertile, large trees—now represented by their petrified trunks—growing on the plains. The water of the lake was probably fresh, and its extent three times as great as at present. On its shores lived an assemblage of giant kangaroos and wombats, as well as wallabies, bandicoots, and marsupial rats, while in the lake and its entrances were crocodiles, the primitive Queensland mudfish (*Ceratodus*), and huge bony fish, all of which have long since disappeared from those waters. Unfortunately, however, a period of diminished rainfall set in, and the lake decreased in size and lost its outlet, partly through the warping of the surface and accumulation of *débris*. It continued to lose water by evaporation, became salt, and the fish and crocodiles were killed. With the progressive decrease of rainfall the vegetation withered, the succulent herbage giving place to dry spiny plants. The giant marsupials died of hunger, and the whole region was blasted into desert.

One of the main points on which Prof. Gregory hoped to throw further light was the age of this desiccation of the Lake Eyre basin, and he was fortunate enough to obtain one important piece of fresh evidence, in the discovery of specimens of the dingo in association with the extinct marsupials. No trace of man or his implements was, however, found with their bones, and Prof. Gregory considers this a strong indication that the animals were not contemporary with man, although some authorities have held that the dingo was introduced into Australia by human agency. He therefore thinks that the great climatic changes

above sketched occurred after the introduction of the dingo, but before the advent of man to this region. The evidence of the native traditions seems also to support this view. The "Kladimakara" legends clearly relate to two different animals—one the diprotodon, which answers to the description of an animal with a horn in the middle of its forehead; the other the crocodile, as it is described as reptile-like, living in water-holes, and devouring people who ventured into the pools. The legends also show variations in other respects, some speaking of the Kadimakara as descending from the sky by gum-trees, while in others it is the ancestors of the present tribes, who are supposed to carry on communication with the sky by means of a tall pole. These variations render it probable, in Prof. Gregory's opinion, that the aborigines did not reach Lake Eyre till the giant marsupials were extinct. As is the way with primitive people, they localized their old stories in their new homes, adapting them to suit local conditions, and to explain the great bones found on the dry beds of Cooper's creek and the Diamantina.

RECENT EXPLORATION IN ALASKA.*

During the past few years the United States Government has continued the exploration of its northern territory with great activity. Both the War Department and the Geological Survey have been at work, the chief object of the former being to construct a road to the upper Yukon, which should lie entirely within the territory of the Republic. Parties have therefore examined the Copper river basin and the adjoining country, while the Geological Survey parties have traversed the greater part of Southern Alaska and obtained a general knowledge of its structure.

The western extension of the St. Elias range is divided by the two main streams of the Copper river into three branches. The valley of the Chittena separates the short Mount Wrangell group from the coast range, which passes round Prince William sound into the Kenai peninsula and Kodiak island, while from the source region of the White and Tanana rivers the Alaskan range runs westwards beyond the Cantwell river and then bends southwards, forming the watershed between the Sushitna and Kuskokwim, and continuing into the Alaskan peninsula and the Aleutian islands. The Kenai mountains rise to heights of 6000 to 8000 feet, and are intersected by broad high valleys. The Chugatch range, which extends from Turnagain arm and Portage bay to the Copper river, is still loftier and more rugged. It probably attains its maximum height in a group of peaks north of Port Wells, and from this point slopes eastwards and westwards. Between the Matanuska and Sushitna rivers lie the Talkeetna mountains, not much lower than the Alaskan range in the west, but probably only 6000 to 7000 feet in height towards the Matanuska river. Between these ranges an interior basin, 1500 to 3000 feet above sea-level, extends eastwards to Mount Wrangell, drained in the west by the Sushitna tributaries, and in the east by the Copper river.

* 'Compilation of Explorations in Alaska,' 1900; 'Reports of Explorations in the Territory of Alaska, 1898, 1899,' Alaska, 1899; 'Copper River Exploring Expedition,' 1900; U.S. Geological Survey, Twentieth Annual Report, Part vii.; 'Alaska' (Harriman Alaskan Expedition), 2 vols., 1901; *National Geographic Magazine*, November, 1901.

The northernmost extremity of the great St. Elias group, near the Scolai pass, was named by Mr. Oscar Rohn, in 1899, Mount Abercrombie. White river descends from the Russell glacier on its northern flank, and is accompanied by a high range on the south. North of the sources of the White river are the Nutzotin mountains, the highest peak of which (over 10,000 feet) has received from Mr. A. H. Brooks the name of Mount Allen, and are succeeded to the north-west by the Mentasta range, between the Copper and Tanana rivers. Immediately south of the Tanana the Alaskan range breaks up into isolated groups, one of which culminates in Mount Kimball, 10,000 feet high, east of the Delta river, while Mount Hayes, to the west of this river, rises to 14,000 feet. West of the Sushitna river the range attains its maximum elevation in Mount McKinley (lat. 63° N., long. 149° W.), the Bolshaya (big) of the Russians, which, standing 20,464 feet above sea-level, is the culminating point not only of Alaska, but also of the North American continent. The Tordrillo mountains, west of the lower Sushitna and the Chigmit, west of Cook inlet, are also very bold and rugged, containing summits 11,000 to 15,000 feet high. In the latter are the two well-known volcanoes Redoubt and Iliamna, 11,000 and 12,000 feet respectively, the latter still steaming. Of the Mount Wrangell group, Mount Wrangell itself is the most prominent feature, towering above its neighbours with a height of over 17,000 feet. To the north and north-west are Mounts Sanford and Drum, and Mount Blackburn to the south-east. Mr. Rohn has not been able to identify Mount Tillman, named by Lieut. Allen, who obtained occasional glimpses of the group from the Copper river in 1885. From Mount Blackburn a range surmounted by a prominent peak, Mount Regal, runs in an easterly direction towards Mount Abercrombie, and from Mounts Wrangell and Sanford a range attaining to heights of 5000 to 6000 feet runs north-eastwards to the Mentasta range.

The White river, which owes its name to the pumiceous volcanic ash with which it is loaded, was discovered in 1850 by Mr. Robert Campbell, of the Hudson Bay Company, and was ascended in 1891 by Dr. Willard Hayes and Lieut. Schwatka. It flows for 200 miles with a rapid current, cutting in its lower course through the Yukon plateau. Broad flat valleys connect its basin with that of the Tanana, and a portage over flat swampy country brought Mr. Brooks, in 1898, from the Snag, an affluent of the White, to Mirror creek, by which he reached the Tanana. Both the Tanana and its great western headwater, the Nabesna, break through the line of the Nutzotin and Mentasta ranges, the latter draining the triangle formed by Mounts Wrangell, Blackburn, and Regal. In the upper course of the Tanana and the section below the trail to Forty-mile river, where there are numerous rapids, the current is swift, but in its middle course the river winds along with a slow current, in some places consisting of a chain of lakes. On the northern side the country is an upland studded with relict hills of the Yukon plateau, such as the Ketchumstock hills. The southern tributaries, the Delta and Cantwell, flow through the Alaskan range from the edge of the Copper river basin. In the lower Tanana all the tributaries make a downstream bend before entering the main stream, indicating a reversal of the drainage, and probably at one time the Tanana above the Volkmar and Goodpaster flowed to the White, which then discharged its waters into the sea by the Alsek valley.

The Etna or Copper river, 300 miles long, has its source in the angle between the Alaskan range and the mountains running north-east from Mount Sanford, a flat area studded with innumerable lakes and bogs. Bending round the Mount Wrangell group, it has cut its bed to a depth of 500 to 800 feet through a recent bed of silts and gravel probably 1000 feet thick. This plateau, near the middle of the basin, has an altitude of 1500 feet, and it rises westwards to 1700 feet at the

foot of Klutena lake, where it joins the vast tundra plateau which forms the watershed towards the Sushitna. Below the mouth of the Chittena the Copper river enters Wood's cañon and commences its course through the Chugatch mountains. It has a current averaging 8 miles an hour, and most of its tributaries are too rapid for navigation. On the right bank it is joined by the Klutena, which rises in a glacier connected with the great Valdes glacier and flows through Lake Klutena or Abercrombie, an elongated depression in the river-valley 30 miles long, probably occupied by a glacier in former times. The largest tributary of the Copper is the Chittena, the Chitty-na or Copper river of the Indians, of which the northern branch, the Nezena, rises in a large glacier on the eastern flank of Mount Regal, which also gives rise to the Tanana. The ascent of the Copper valley from the delta being exceedingly difficult both by land and water, Captain Abercrombie, to whom the task of constructing a military road has been entrusted, chose Port Valdes, further west, as his point of departure. The inner bay, 10 miles long by 4 wide, is open all the year round. At its eastern end the Lowe river enters, descending from Marshall pass, 1700 feet above sea-level, on a watershed whence the Taznuna flows to the Copper. A road is being made up the Lowe river and over the Thompson pass, 2840 feet, to the valley of the Tonsina, a tributary which joins the Copper between the Chittena and Klutena, and will be continued up the Copper river basin. The Tanana may be reached by the Slana river, the Mentasta lake and pass (2300 feet), and the Tok river, and thence the journey may be continued to Forty-mile river and Eagle City.

Cook inlet receives the Matanuska and Sushitna rivers. The former, more than 100 miles long, rises on the north side of the coast range near the head of the Tazlina, which flows through Lake Pleveznie to the Copper. The Matanuska affords easy access to the interior, the watershed at the head of Delta river being only 3000 feet above sea-level. It flows at a rate of about 10 miles an hour, and has cut down its bed 400 to 500 feet below an old valley floor. The Sushitna rises in the angle between the Talkeetna and Alaskan ranges, and one of its headstreams probably drains Lake Louise at the edge of the Copper river basin. Its great tributary, the Chulitna, runs a little west of south at no great distance from the main river, receiving many affluents from Mount McKinley and the neighbouring peaks, and enters the Sushitna about 80 miles above its mouth. From its sources, two passes, 3700 and 4200 feet high respectively, lead into the Tanana basin, in all probability to the Cantwell river. The Sushitna flows through a picturesque gorge which, like that of the Matanuska, has been cut in the bottom of an earlier, though comparatively recent, valley. Twenty miles from the delta of the Sushitna the Yentna enters, coming, it is said, from Mount McKinley. Along this river and its right-hand tributary, the Skwentna, Mr. Spurr travelled in 1898 to the Kuskokwim through the Tordrillo mountains, making a portage over a pass 4400 feet high. The Kuskokwim, running northwards, skirts the Tordrillo mountains, and then breaks successively through two parallel ridges, the Teocalli and Terra Cotta, emerging on to a broad gravel plateau which slopes towards the west. For 100 miles it flows swiftly down the plateau, and then enters a flat country, through which it meanders down to the trading-post, Vinasale, about 390 miles above Bethel. Mr. Spurr also ascended the Kanetok river and crossed to the Togiak lake, unknown before, returning to the coast by the Togiak river.

The foundation of the country is composed of gneissic rocks in the east, while in the west granite is the base-rock. Above these lie schists and Silurian beds, except in the south-west, where the oldest formation observed by Mr. Spurr was the Tachatma (tributary of the Kuskokwim) series, corresponding generally to the Takhandil series of the Yukon, in which Carboniferous and Devonian fossils have

been found. Cretaceous rocks have been observed in the Copper river district, on the Matanuska and in South-Western Alaska. The Alaskan mountains seem to have been elevated by foldings in post-Cretaceous times, for the Cretaceous beds are folded with the underlying strata, and the movements probably continued down to the close of the Miocene period. In South-Western Alaska the main axis of folding runs from north-east to south-west. Secondary folds are everywhere present, and Mr. Brooks found that the main direction on the White river, north-west to south-east, became the secondary on the Tanana. Whether all the ranges were elevated at the same time is as yet uncertain. Possibly the Chugatch mountains are of later date than the Alaskan range. In the Pliocene age, after a drainage system had been developed, a subsidence took place, the sea filling the area between the Alaskan and Chugatch ranges, and then, partly by glacial action, the gravels were laid down, which, along the Matanuska, now rise to a level of 2700 feet. In recent times the land has risen, in some places to as much as 3000 feet above its lowest position, the stages of elevation being marked by terraces. When a new system of drainage was developed, the Copper river basin probably discharged its water into Cook inlet, until a stream, cutting back its course through the Chugatch mountains, tapped the lake in which the fine silts of the Copper river basin were deposited. Intrusive rocks are of frequent occurrence, and auriferous quartz or placer gold is found in most of the valleys. Volcanic action has manifested itself in pre-Cretaceous times and down to the present day. Mount Wrangell often send up vapour, and in 1899 discharged a stream of lava. Copper is worked, and iron, cinnabar, arsenic, antimony, and manganese have been reported.

Boulders of unmistakably glacial origin among the silts of the Copper river basin indicate a more extensive glaciation in Pleistocene times than at present. There does not, however, appear to have been a universal glaciation of the whole surface, and, indeed, in South-Western Alaska the glaciers were, in Mr. Spurr's opinion, not much more numerous or larger than at the present day.

The Harriman expedition, under Prof. Brewer, made an important exploration of the southern coast in 1899. Its chief geographical discovery was that an inlet about 20 miles from the mouth of Port Wells, apparently closed by a glacier, opened into a beautiful fjord 15 miles long, to which the name Harriman was given. Of the work of parties sent out in 1901 by the U.S. Geological Survey, no full account has yet been published. Mr. Peters crossed from Bergman, a trading-post on the Koyukuk river, to the Colville river and the Arctic ocean, crossing the watershed 100 miles from Bergman. Rolling tundra extends thence to the coast. Another party, under Mr. Mendenhall, reached Bergman by the Dall and Old Man rivers, and made its way westwards to Kotzebue sound. Mr. Gerdine completed the mapping of Seward peninsula, and Mr. Brooks visited Prince of Wales island and the mainland to the north-east. There are still tracts between the upper Kuskokwim and the Yukon, and on the arctic slope between the Canadian boundary and the Colville river, and between Howard's route in 1886 and the western coast, which have not yet been explored, and the geology of Southern Alaska is by no means thoroughly worked out.

THE FJORDS AND BAYS OF ICELAND.

Dr. Thoroddsen, the indefatigable explorer of his native island, has contributed to the *Geografisk Tidskrift*, Bd. 16, Hefte 3 and 4, a paper on the contours and origin of the bays and fjords. The coast-line of Iceland, over 3700 miles in length, is deeply indented, except on the southern side, where it is generally low and

consists of sandy and gravelly flats, the *débris* carried down by the innumerable glacier streams. The complete absence of fjords is, however, only apparent, for were the sea-level raised 300 to 600 feet they would be fairly frequent. The inlets on the Icelandic coast are of two kinds—large bays of various forms and fjords proper, which are generally rather narrow, and sometimes the two are combined. The two largest bays are Faxebugt on the south and Bredebugt on the north of Snæfelsnes. Faxebugt, 40 miles long by 55 broad, becomes gradually deeper towards its mouth, where it sinks to 50 to 60 fathoms. At its head lies a stretch of low land, 390 square miles in area, called Mýrar, which has an elevation of only 60 to 100 feet, and is enclosed by heights of 650 to 1600 feet. The valleys that run into it have been carved out by erosion, while the Faxebugt and low land are an area of subsidence separated by faults from the main mass of the island. Probably the subsidence took place in Tertiary times, but small movements have continued since even up to the present time, earth-tremors being very frequent in this neighbourhood. At the end of the Tertiary period the valleys and fjords (Hvalfjördr and Borgarfjördr, etc.) opening into the depression were eroded till they assumed much the same form and depth as at present. Just before the Glacial period, or possibly during the first glaciation, conglomerates were accumulated here and there in the valleys and on the low land; somewhat later, doleritic lavas streamed down the erosion channels, glaciers descended along every valley, ground down the lava, and carried away part of the conglomerate; then the sea rose over the flat land up to the valley mouths, and rivers from the glaciers deposited on the bottom a layer of clay containing *Yoldia* and other arctic shells. At the end of the Glacial period the sea retired to the present coast-line.

Snæfelsnes is a *horst* produced by the subsidence of the Faxebugt and Bredebugt. The latter also originated in Tertiary times. Another bay caused by dislocation also existed in the Glacial period in the southern lowland, but its bottom is now above water. The fjords of the north-western peninsula are shown by Dr. Thoroddsen's description to be typical fjords cut through flat or slightly sloping layers of basalt. Some of the smaller ones are deeper towards the head, and most of the others are rather deeper in the middle than at the mouth. The valleys are short and end in steep heads. Striæ are frequent, but moraines are not extensive; perhaps they have been swept away into the sea. Húnaflói is, doubtless, a subsidence basin, though its geology is not sufficiently known, and therefore its origin cannot be proved. Between it and Skagafjördr lies the peninsula Skagi, a singular geological structure, quite different from the other promontories of the north coast west of Skjálfandi, and later than these. Volcanic eruptions have taken place here at a later period, and therefore it is not improbable that subsidences have occurred on both sides. As far as Skjálfandi, the northern land consists of slightly tilted or horizontal beds of basalt, but here the structure suddenly changes, later volcanic rocks appearing in a broad belt which extends eastwards to Langenes. On the west they are bounded by the longest and most important line of fracture in Iceland, which runs along the west coast of Skjálfandi and the Bárdar valley into the interior, where it can be traced for 60 miles southwards. The Skjálfandi and the succeeding Axar and Thistil fjords are similar in contour and depth, have all been produced by subsidence, and have no resemblance to true fjords. All the fjords of the east coast north of Seydisfjördr have only a small depth and a continuous slope outwards. Seydisfördr, begirt by mountains 3300 feet high, is somewhat deeper, and has in the middle a basin 40 to 47 fathoms deep, while it is shallower at the mouth. Beyond Beru fjord to Reykjanes there are no fjords, but only very shallow lagoons.

The inlets on the Icelandic coast are either bays produced by subsidence or

fjords carved out by erosion. The latter occur either as ramifications of the large bays or in independent groups opening out directly to the sea. The bays are generally broad, with depths small in comparison to the area, and bottoms sloping continuously outwards, whereas the fjords which run into them are often of great depth, and contain hollows going down to a lower level than that of the main bay. Many of the large bays are certainly the result of faulting and subsidence, while the origin of others is not determined because their geology is imperfectly known, but they are probably due to the same cause. The fjords are similar to those of other countries, but they are neither so deep nor do they branch out into so many arms. There are also no deep sounds connecting different fjords. The only two large groups of fjords opening out to the sea are in the north-western peninsula (eight main fjords with eighteen branches), and on the east coast, between Hjeradsflói and Lón (ten main fjords with three small branches).

Iceland stands on a submarine plateau, in general marked out by the 100-fathom line. The plateau has a breadth of 60 miles and more, and is steepest off the southern coast, where the depth at only 11 miles from the shore sinks from 100 to 700 fathoms. Off the north-western peninsula, on the other hand, it has a breadth of 55 to 60 miles, and then slopes gently to a depth of 700 fathoms at a distance of 170 miles from the coast. Peculiar to the Icelandic plateau are the regular indentations in the 100-fathom line all round the coasts, which indicate the existence of submarine fjords closely connected with the land valleys and fjords. The fjord basins run straight out, their mouths lying at a depth of about 130 fathoms, beyond which they entirely disappear, so that it may be assumed that the coast-line stood at this level at the time of their formation. The submarine plateau must have been moulded by marine abrasion, accompanied by a positive displacement of the coast-line. It cuts into the land, like all abrasion surfaces, horizontally, without regard to the formations and their older lines of fracture. In the middle of the Miocene age, Iceland was a much more extensive land than it now is, and was built up of horizontal basalt beds and plateaus, which were rent asunder in various ways by the violent tectonic movements at the end of the period. Between the Miocene period and the deposition of the Red Crag, lying in thick beds unconformably on the basalt in Skjálfandi, the abrasion must have taken place which removed about 60 miles of the solid mass of the island, 1600 to 3200 feet thick. At the end of the Pliocene age the land gradually rose 800 feet, and the valleys were excavated by streams and floods descending from the older valleys in the interior. Possibly this erosion took place in the earliest times of the Glacial period, when glaciers began to appear on the inner highlands, but had not yet spread over the whole land. It was then, also, probably that the conglomerates were formed which filled the Tertiary valleys of Western Iceland, and are distributed over the southern lowland.

Dr. Thoroddsen describes more or less minutely all the important indentations, and gives reasons for the conclusions he has arrived at. He also discusses the basalts and other volcanic rocks, from Ireland and Scotland to North-East Greenland, which now occupy an aggregate area of 54,000 square miles.

THE DEFLECTION OF THE PLUMB-LINE IN INDIA.*

By E. A. REEVES.

The question of the deflection of the plumb-line from its true vertical position, owing to the unequal effect of gravity occasioned by irregularities in the formation of the Earth's crust, is one that calls for most serious consideration whenever a complete trigonometrical survey of a country is undertaken. Such irregularities cause errors in the astronomically determined positions, inasmuch as they affect the levels of the theodolite with which the observations are taken. Even in comparatively flat countries, such as Russia, this is a subject which cannot be ignored, and near Moscow, on a line 60 miles long, running nearly east and west over a plain, northerly deflections of 8″ are found, while along a parallel line 9 miles to the south the plumb-line hangs vertical. Along a third line, 9 miles further to the south, there is a southerly deflection of 8″. This is doubtless an exceptional case, and there are probably few places on the Earth's surface with so great a change in the direction of the plumb-line in so short a distance. Yet, as might be expected, in India, with the massive range of the Himalayas stretching across its long northern frontier, the question is by no means insignificant, and in very early days of the Indian trigonometrical survey it was recognized that it would have to be carefully considered. It was found, for instance, that the latitudes of places resulting from observations taken with the best instruments and computed with the utmost care, would not coincide exactly with the results obtained by triangulation. Similar differences were also noticed in the longitudes and azimuths. Although these differences nowhere amounted to more than a few seconds, it soon became evident that they were not accidental, nor due to errors of computation, and could only be attributed to the deflection of the plumb-line due to inequalities in the attraction of gravity. Naturally, the great mass of the Himalayan range was turned to as the principal cause of these abnormal conditions, and in the earlier days of the Survey of India a good deal was written upon the subject with a view to its fuller investigation. Elaborate computations were, amongst others, undertaken in 1852 by the late Archdeacon Pratt, of Calcutta, at the request of Sir Andrew Waugh, the then Surveyor-General of India, the results of which were afterwards given in the *Philosophical Transactions of the Royal Society*. As a consequence of these investigations it was pretty generally accepted that the effect of the Himalayas on the direction of the plumb-line in India was compensated by the deficiency of matter beneath that range, or some other cause, and it has for the last forty years or so been considered impossible that the range can exert any influence upon the direction of the plumb-line so far south as Central India; thus it was supposed that all observed discrepancies between the astronomical and geodetic positions of places at any considerable distance from the Himalayas were due to local inequalities. The principal reason for believing that the attraction of the Himalayas was counteracted by an invisible cause was the fact that the observed effect of the attraction of the Himalayas on the plumb-line at Kaliána (in lat. 29° 30′ 48″), the northern terminus of the Indian Arc, is 5″·236; whilst the attraction of the apparent or

* 'The Attraction of the Himalaya Mountains upon the Plumb-line in India.' Considerations of Recent Data by Major S. G. Burrard, R.E., Superintendent Trigonometrical Surveys. Published by direction of Colonel St. G. C. Gore, R.E., Surveyor-General of India. Professional Paper No. 5. Dehra Dun: printed at the Office of the Trigonometrical Branch, Survey of India. 1901.

superincumbent mass of the Himalayas at that point is sufficient to produce a deflection of 27″·853, according to the calculations of Archdeacon Pratt. But, as will be seen later on, Major Burrard, in the report now under consideration, clearly shows that, owing to our more perfect knowledge of the vast mountain systems of Northern India, and a more complete acquaintance with the depths of the Indian ocean, together with other reasons, it is necessary that the argument should be reconsidered, and the computations made over again; and when this is done, he comes to the conclusion that there is no reason to suppose that the effect of the Himalayas upon the direction of the plumb-line does not extend to Southern India, and even at Cape Comorin the range may cause a deflection of one or two seconds.

The question of the deflection of the plumb-line in India is surrounded with many difficulties and obscured by apparent inconsistencies; nor does Major Burrard profess to have finally cleared up the matter, although his work is most important as being a re-investigation of the subject, based upon the most recent data. Before a thoroughly satisfactory conclusion can be arrived at, many more observations must be taken and additional information obtained; but, as Major Burrard states in his preface, "a periodical investigation is essential, if we wish to design the most profitable programmes of future work." For many years the subject may be considered to have been in abeyance, except for the ever-accumulating evidence necessarily resulting from the progress of the Indian Trigonometrical Survey, and it was only seriously revived by the paper read by the late General J. T. Walker (Surveyor-General of India) before the Royal Society in 1895. Before it is possible to ascertain how much the Himalayas deflect the plumb-line throughout India, it is, of course, necessary to clear each observation station from the effect of *local* attraction, and in order to do this, General Walker in his paper proposed the "group" system, *i.e.* that each station should be surrounded by other stations at short distances from it, and that observations should be taken at all of these, from which the amount of *local* attraction could be ascertained. In the same paper he attempts to explain the preponderance of northerly deflections throughout India, by assuming that local attraction is producing a *southerly* deflection at Kaliánpur, the station of reference of the Indian Survey.

This paper brought the question again into prominence, and it was decided by the Survey of India to carry out General Walker's suggestions, and establish a "group" of observation stations around Kaliánpur, in order to determine the local attraction at that place.

The result of the observations taken at these stations is given in Major Burrard's report, on page 7 of which appear the three following values of the latitude of Kaliánpur:—

	°	′	″
Value adopted in computations of the triangulation	24	7	11·26
Mean observed value of six different observations taken at Kaliánpur itself, by different observers between 1824 and 1899 (the greatest difference between them being 0″·85) ...	24	7	10·97
Value derived from the group	24	7	11·57

On the assumption that the last of the three, the value derived from the group is freed from the effect of local attraction, it is deduced that the astronomical zenith at Kaliánpur is displaced 0″·60 to the south, and that there is a deflection of the plumb-line in the meridian at Kaliánpur of 0″·60 to the *north*. This result was quite unexpected and surprising, for instead of the local deflection being southerly at Kaliánpur, as General Walker had predicted, it was thus found to be *northerly*. After this the whole subject was reopened; observations were extended, fresh computations made from the latest information, old theories and conclusions

reconsidered, the account of all of which Major Burrard gives in his report, which represents a vast amount of most painstaking work.

This report consists altogether of one hundred and thirty pages of letterpress, in addition to numerous charts and diagrams, and is divided into seven sections, as follows: I. On the errors of the initial values of latitude and azimuth in India. II. The deflections at Kaliánpur calculated from the configuration of the ground in the vicinity. III. The Pendulum Observations at Kaliánpur. IV. (*a*) The influence of the Himalaya mountains and of the Indian ocean on the plumb-line in India; (*b*) the disturbance of the sea-level; (*c*) geological considerations. V. Comparison of calculated with observed values of deflections in the meridian. VI. Comparison of calculated with observed values of deflections in the prime vertical. VII. It is inferred that a hidden cause in Central India is masking true Himalayan effects. These are the headings of the principal sections of the work, and from them some idea may be obtained as to its scope and arrangement, which, as might be expected, is clear and satisfactory. In addition to these chapters there are two appendices, one giving a description of the stations of the Kaliánpur group, and the other the results of the azimuths observed in India and Burma. A useful epitome of the work is also given at the commencement.

There are altogether fourteen charts and diagrams, which serve well to illustrate the text, besides numerous pages of tabular matter. Some of the diagrams are very ingeniously arranged, and convey at a glance a great deal of information. Among the more interesting of these are those showing the local attractions in the meridian, and in the prime vertical at the stations of the Kaliánpur group, and the outline charts of India illustrating the positive and negative areas of (O–C) in latitude and azimuth. Positive areas are tinted red, and negative left white. Throughout the work "O" is taken as the astronomically observed latitude or azimuth, and "C" that computed from the triangulation. In the case of latitudes, if the plumb-line at any station is attracted to the north, the zenith will be displaced to the south, the observed latitude or O will be too small, and (O–C) is then a negative. As regards azimuths, if the plumb-line at any station is attracted to the east, the zenith will be displaced to the west, the observed azimuths or O, measured from south by west, will be too small, and (O–C) is again negative. When the opposite is the case, O–C is considered positive. It would have been interesting if specimens of the actual computation of the astronomical positions had been given, as well as a description of the instruments used, and the methods employed for eliminating the effects of refraction, which must be a matter of special importance when the whole argument sometimes depends on a second or two of arc, or indeed, as it is at times, the fraction of a second. As a frontispiece is given a cross-section of the outer Himalayan ranges on the meridian of 77° 25′, constructed from the contoured maps of the Indian Survey by Colonel St. G. C. Gore, R.E., Surveyor-General of India.

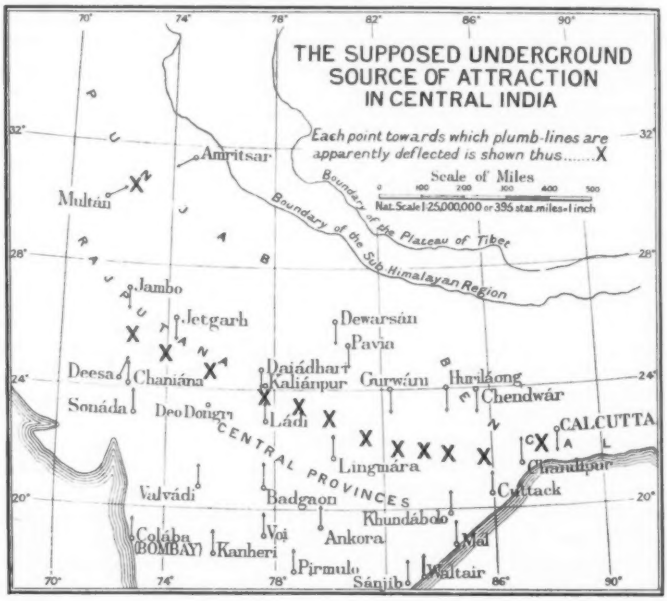
In his preface Major Burrard acknowledges the great assistance he has received from Mr. C. H. McA'Fee, Extra Deputy Superintendent, who has taken charge of the publication of his work; from Mr. C. L. Griesbach, C.I.E., Director of the Geological Survey of India, who has supplied him with valuable geological information, and several others. He also states that "a sense of loyalty to General Walker renders criticism of his theories an unwelcome task:" "and that such criticism can only be based on data that were never at his disposal, and that have been accumulated since his death." Many of the formulæ used in the computations are those arranged by Colonel A. R. Clarke, C.B., R.E., F.R.S., and given in his well-known work on geodesy.

It may be well now to state the principal conclusions which Major Burrard

considers these investigations point to, although he is evidently prepared to admit that further information may lead to their modification. He sums them up himself in the following words:—

1. "It is now believed that the coincidence of the change of sign of the deflections with the parallel of the station of origin is accidental, and possesses no significance." (It was previously considered an important and suggestive fact that at lat. 24° N., the latitude of Kaliánpur, the station of origin or reference, the sign of the deflection changed from north to south.)

2. "The change of sign in the deflections along the parallel of 24° is attributed to a great underground chain of excessive density stretching across India from east to west for over 1000 miles, the effects of its attraction being visible from lat. 16° to lat. 30°." (Chart No. 12 of the report, which is here reproduced, shows this supposed underground source of attraction.)



3. "This chain is the probable cause of the positive deflections north of lat. 24°, and of the negative deflections south."

4. "It marks the true effects of Himalayan attraction: Himalayan effects thus suffer from both compensation and obscuration."

5. "The longitude arcs of the Punjab lead to the belief that the underground chain tends to the north-west in Rajputana, and maintains a parallelism with the Himalayas."

6. "The effects of the chain are superimposed on those of a far-reaching Himalayan attraction, the latter perhaps deflecting the plumb-line at Cape Cormorin through one or two seconds of arc."

7. "South of the chain, from lat. 20° to lat. 8°, the northerly deflection of the plumb-line has been observed to decrease gradually for 800 miles, the total decrease amounting to 10″ from −8″ in lat. 20° to +2″ in lat. 8°; this decrease is possibly a Himalayan effect."

REVIEWS.

ASIA.

The Philippine Islands.*

That the acquisition by America of a group of islands so importan , so rich, and, it may be added, so little known as the Philippines should be the signal for the appearance of several works upon the archipelago is no more than might be anticipated. Mr. Foreman's long acquaintance with Manila, and his knowledge of island politics, fully justified his volume; while that of Prof. Worcester was no less acceptable as the personal experience of a naturalist who has perhaps travelled as widely among the islands as any European now living. But neither of these authors presented us with what is felt to be a distinct want here not less than in America, namely, a trustworthy and complete book of reference upon the archipelago. Those personally acquainted with the country and the wonderful amount of work done in it by the Jesuits were not without hope that something of this nature might be looked for from them. This hope has, in one sense, been fulfilled in the volumes now before us.

The book, as we learn from the introduction, is a direct outcome of the war. Hostilities had not been long in progress before the greater part of the missionaries were compelled to take to flight, and it was during the long period of waiting in Manila, while return to their cures was impossible, that the plan was conceived of compiling the work and publishing it contemporaneously with the new atlas of the archipelago, which for some months previously had been in course of preparation in the Observatory of Manila, under the able direction of P. Jose Algué, S.J., the head of that institute. The fall of Spain seemed likely to postpone all chances of publication, but the Philippine Commission came to the rescue, and the title-page bears the name of the Washington press.

The work, which is in two most cumbrous volumes, the first of which alone weighs some 9½ lbs., aims at being both a presentment of what was previously known concerning the archipelago, and also the first-hand knowledge and observation of various members of the Society of Jesus. An unsatisfactory feature about it, however, is that it is by no means easy to discover in every case whether the information is to be ascribed to the former or the latter source, and the references given are both scanty and incomplete. A section on the general geography of the group opens the first volume, each island and district being taken in order and dealt with under the heads of population, inhabitants, villages, language, productions, means of communication, and so on, and a good deal of original information is doubtless included in these 150 pages, drawn from the actual knowledge or research of the Jesuit personally familiar with the district. Much, however, is undoubtedly due to the *Guia Oficial*, and even more, perhaps, to F. X. Baranera's *Geografia de Filipinas*. The population still remains very uncertain, but the authors seem to think, working by ecclesiastical data, which are probably less in error than the lay estimates, that the "census" of 1894—which was, of course, largely guesswork—is not far wrong for the present day. This puts it, roughly, at about 8,000,000, and though there have been eight years for increase since that time, war and disease

* 'El Archipiélago Filipino: Colección de Datos Geográphicos . . . entresacados de anteriores Obras, ó obtenidos con la propia Observación y Estudio por Algunos Padres de la Misión de la Compañía de Jesús.' In two volumes, 4to. pp. 708 and 469 with Atlas fo. Washington: Imprenta del Gobierno. 1900.

have counterbalanced the latter. The American Commission officially adopted this figure, but it is noteworthy that it is nearly 2,000,000 higher than Réclus's estimate.

The chapter on ethnology is distinctly disappointing. There is, it is true, a useful map of the distribution of the different tribes, but a singular absence of the specialist's method characterizes the ninety pages devoted to this subject, and it is little more than a compilation from previous writers, though the Mindanao tribes are more carefully described, as might be expected, for this island was entirely given over to the ministration of the Jesuits. P. Joaquin Rajal holds the Bagobos and Manobos of Mindanao to be of the same race as the Hovas of Madagascar, and most of the Indonesians are regarded as having worked eastwards through Sulu to this island, just as in later times the Mohammedan "Moros" undoubtedly did. When these latter fierce people, at one time the terror and scourge of the archipelago as far north as Manila, really made their appearance is still uncertain. By some writers their advent is considered to date from quite an early period in the history of the faith, while others hold that it was not long anterior to that of Magellan. The Jesuits are of opinion that the Mamanuas, now confined to the northern part of the eastern cordillera of Mindanao, are the true autochthones of this island. The Manguianes of Masbate, Tablas, and Ticao islands are also held to be of Negrito stock. Bearing in mind the interest which has always been taken in the study of the numerous languages and dialects of the archipelago by the members of the society, it is disappointing to find only seventeen pages of generalities as the sum of the information afforded upon this subject.

Under the head of "Estado de Cultura" come, in rather incongruous juxtaposition, religion, agricultural questions, industries, trade, and public works, all of which are treated from a general point of view only, and are allotted about a score of pages each. The unsatisfactory state of present-day cultivation is vigorously condemned, as are also the indifference and laziness of the Filipino, which form perhaps the greatest difficulty with which America will have to contend, unless by a strange irony she finds herself throwing open the gates to Chinese labour. The land is of surprising fertility, but no development is possible without proper roads and railways. Of the latter, an elaborate scheme is already under consideration, but the torrential rains of many districts render both the construction and maintenance of these, and, indeed, even of ordinary roads, a most expensive matter. The introduction of new stock, proper machinery, new products, etc., is strongly counselled, together with the establishment of model farms and schools of agricultural instruction.

No history of the archipelago is attempted, the compilers confining themselves to a chronology of notable events from the period of Magellan's arrival in Cebu. This is followed by a chapter on the orography, and one on the hydrography of the islands, both being little more than extended lists of place-names. A somewhat elaborate section, however, deals with the thermal and mineral waters, giving the chemical composition of many of them, and the medical properties for which they are famous.

It is, however, in the natural history section, which brings the first volume to a conclusion, that the deficiencies of the work are most apparent. That the portion dealing with geology and mineralogy is of no great length is not surprising, for all that is thoroughly known in these branches of science is confined to a few localities in Luzon and the islands of Cebu and Panay. We shall have to wait till the railways with their jungle-clearing, cuttings, and tunnels have rendered the necessary assistance before much can be hoped for in this respect. But with botany and zoology it is a different matter altogether. Rich as are the fauna and flora of the archipelago, our knowledge of them is on the whole remarkably complete. Don

Sebastian Vidal, Mr. R. A. Rolfe, Mr. Burbidge, and others have done much in working out the botany; while Dr. Steere, Prof. Worcester, Mr. John Whitehead, and Mr. Everett have most thoroughly explored almost all the chief islands of the group in search of birds and mammals. Probably not less than eighty technical papers on the birds of the Philippines have been published during the last quarter-century, and it would be a matter of the greatest difficulty for a collector to discover a new species at the present time. That the compilers, however, are cognisant of the work that has been done by foreign naturalists, English, American, and German, does not anywhere appear. They make mention of Señor Vidal, and various lists of commercial plants and timber trees are given, together with a page or two on "plantas de adorno," in some or all of which his authority may be traced. But no attempt whatever is made at giving lists of the mammals, birds, etc., of the archipelago.

But though the first volume thus leaves much to be desired, not only in respect of the deficiencies we have named, but also, it may be added, in the clumsiness of its arrangement, the second volume may be cited as a remarkable example of the diligence and skill of the brethren of the Society of Jesus in their work at the far-famed observatory of Manila. To P. Federico Faura is due the honour of the latter's foundation. The fact was early recognized that the direction of the typhoons is almost invariably from the Pacific towards the Asiatic continent, and that the archipelago thus forms an advanced post, whence, in most instances, warning of the coming hurricane can with certainty be given. It was not possible at that time to utilize this knowledge, and Faura, after starting the observatory in 1865, had to be content with the records of his instruments in the capital. Recalled to Europe for some years, he returned in 1878, fired with the enthusiasm born of his visits to the most noted observatories. His first announcement of a typhoon was made on July 7, 1879, and he foretold its course. In 1880 was commenced the telegraphing of warnings to Hongkong. Four years later the observatory was recognized as official, and a service of fourteen secondary meteorological stations throughout Luzon was arranged. In 1890 co-operation with the Japanese central observatory at Tokio was effected. The records are now daily received from the secondary stations, and from the coasts of China and Japan, and the probable weather for the next twenty-four hours is telegraphed everywhere.

The second volume is rather intended for consultation than for reading, packed as it is with endless tables, diagrams, and seismographic tracings. After a description of the Manila observatory and its instruments, sections are devoted to barometric readings, temperature, hygrometry, rainfall, cloud conditions, typhoons, etc.; and it would appear that much, if not all, of this part is from the pen of the director of the observatory himself, P. José Algué. The astonishing differences in the rainfall in various localities, both as regards season and volume, are characteristic of the group. Even at Manila, where it would seem to be not unusually inconstant, considerable variation exists. Thus in 1867 121 inches were recorded, and in 1885 only 36.

Considerable space, as might be expected, is devoted to the subject of typhoons. In the nineteen years from 1880 to 1898 inclusive, no less than 397 visited the islands. The greatest number recorded in any one year was 28, and the fewest 11, the average being slightly under 21. No typhoon has been known to occur in February, and the first four months are generally exempt. July, August, and September are the three worst months, the last especially, the nineteen years showing a total of 79 for that month, or a yearly average of 4·2. Père Algué gives maps of what he terms the eleven principal types of typhoons, the classification being founded on their point of origin and their course.

Under American rule a project is in hand for the establishment of an extended network of observatories. There are to be nine meteorologico-seismic stations of the first class, at Aparri, Cape Bolinao, Daet, Albay, Tacloban, Cebu, Bacolod, Iloilo, and Zamboanga; twenty-eight of the second class, and sixteen of the third, with thirty-seven pluviometric stations. Daily records are to be interchanged with twenty-six foreign stations extending all along the coast-line of the Asiatic continent from Saigon to Tokio, and from as many of the Pacific islands as can be arranged. Already daily communication is established with eighteen of these foreign stations.

The archipelago being no less scourged by earthquakes than by typhoons, seismic observations form a most important part of the work of the Jesuits both in Manila and elsewhere, and a great part of the second volume is devoted to their record. Ten great earthquake foci are recognized, and Luzon and Mindanao are shown to be the most affected, all the foci, with one exception, being situated in these two islands. In Negros, Cebu, and Bohol earthquakes are rare, and they are unknown in Palawan; another proof, if any were needed in addition to the overwhelming zoological evidence, that this latter island properly forms part of the Bornean system, and is only politically Philippine.

The volumes abound in illustrations, for the most part reproduced by process from photographs. We recognize several of Dr. Bourn's plates, but no acknowledgment is made of them. Among them is one entitled "Bullock wallowing," which is none other than the tamarao (*Probubalus Mindorensis*), the remarkable anoa-like animal, peculiar to Mindoro, which was first obtained by the Steere expedition. The paucity of native types is to be regretted. On the whole the work fails to satisfy either the general or the scientific reader. The former is unlikely to attempt the assimilation of its twelve hundred pages, while many branches of scientific knowledge are so incompletely treated as to render it most disappointing to the latter. There is, moreover, no index, and the difficulty which besets the reader desirous of finding a reference is very great. At the same time the mass of data afforded, especially in the second volume, is not only important and useful, but also, so far as we are aware, for the most part unattainable elsewhere, and the work is therefore one which the student of this important region cannot afford to ignore. The accompanying atlas comprises twenty-five good topographic maps of the islands, and five others, among which the seismic and ethnographic are the most noteworthy. The index is ample, but the reader in search of a place has to be content with the number of the map on which it figures, and is afforded no further aid to its discovery. F. H. H. G.

AMERICA.

Central America and West Indies.*

This volume appears at a psychological moment, when general attention is attracted to the movement of the United States towards the West Indian islands and Panamá; therefore the well-classified data, physical, geographical, descriptive, biological, and historical, with which it abounds is of special interest to the world. Its value is enhanced by numerous illustrations; but more especially by ten artistic

* Stanford's 'Compendium of Geography and Travel' (new series), Central and South America, vol. ii., Central America and West Indies. By A. H. Keane, F.R.G.S. Edited by Sir Clements Markham, K.C.B., F.R.S. London: Stanford. 1901.

and carefully executed maps of the countries under consideration. Mr. Keane says, "The Greater and Lesser Antilles, which describe a somewhat undulating curve of over 1000 miles between Yucatan and Venezuela, are composed, to a large extent, of sedimentary rocks which have been subjected to much folding and dislocation. It is thus obvious that they represent the crests and summits of one or more continuous mountain chains, which are now, in great measure, submerged beneath the Atlantic waters, but at one time presented an unbroken isthmian bridge between Florida and Venezula—that is, between the Northern and Southern Continents." A bathymetrical map of the Atlantic ocean accentuates this quotation, and shows the long curved line of the Windward and Leeward islands resting on a submerged plateau which forms the base of Puerto Rico, Haiti, and Cuba, and then, under the name of the Bahama banks, stretches north-west almost to a union with Florida. From this peninsula, it is cut off by the deep submarine gorge called the Straits of Florida, through which the Gulf Stream finds its way at a pace of from 2 to 6 miles an hour; so that, as the author says, having in mind the great archipelago which once extended from Panamá to Mexico, "if the Northern and Southern Continents were formerly separated in the west, where they are now united, they may well have formed continuous land in the east." Subterranean agencies have been unusually active in the region bounded on the south-west by the Central American States, and on the north-east by this long submarine isthmus. In it are found the "Mexico Basin," much of it having a depth of 2000 fathoms; the "Bartlett Deep," lying between Cuba and Yucatan and showing soundings up to 2500 and even 2800 fathoms; and the great "Caribbean Basin," averaging about 2400 fathoms deep, and at times descending to 2800 below sea-level. If all of these could be drained, there would be three vast valleys margined continuously by a lofty mountain chain about 10,000 miles long, rivalling in unbroken elevation the Cordillera of the Andes, the grand northern sentinel of which, the dome of Santa Marta, would, overlooking the largest valley, tower 35,000 feet from base to summit. Such would be the appearance of this large area of the globe to which Mr. Keane calls our attention. To its main lands and islands, including Mexico and the three Guayanas, he assigns a population of 22,547,350.

As to the area of Mexico, under Spanish rule, in contact with the undefined French colonial possession of Louisiana, Mr. Keane remarks, "What Louisiana meant nobody quite knew; and in the opinion of some international jurists, the expression covered everything between the south-eastern states" (of the United States) "and the Rio Grande del Norte."

Louisiana in Spanish colonial days was certainly a vague expression, with debatable frontiers as between Spain and France. When the territory was transferred to the United States its boundaries seem to have settled themselves, although even up to 1819 the United States claimed that the area included in the Louisiana purchase extended to the Rio Grande, and included the whole of the province of Texas, then under the government of Mexico. A short digression regarding Mexico and Louisiana may be pardoned. When La Salle, on the bank of the Mississippi river, (which he named the Colbert), took possession of the region in the name of Louis XIV., he did not include the present state of Texas; nor does the old map of Franquelin, 1684, claim anything south-west of the Mississippi, although it includes all the area east of that stream lying between the Ohio river and the great lakes. When France ceded Louisiana to Spain, November 3, 1762, no definite boundaries were fixed; and they were equally undetermined when Spain, about three months later, under the treaty of Paris, ceded to Great Britain the whole of Florida, including all the possessions of Spain in North America, lying east or south-east of the Mississippi, these being an undefined part of Louisiana. Twenty years later, we find Great

Britain, in 1783, re-ceding Florida (east and west) to Spain in exchange for the Bahamas. Again the political kaleidoscope revolves, and, under the treaty of San Ildefonso (1800), Spain retrocedes to France the territory of Louisiana, creating a somewhat bitter feeling in the United States, to be followed, however, by an offer from Napoleon, in 1802, to sell the territory to that country, which was done, in 1803, for $15,000,000. The purchase comprised all of the present states of Louisiana, Arkansas, Missouri, Iowa, the part of Minnesota lying west of the Mississippi river, all of the Indian territory, part of Oklahoma, nearly the whole of Kansas, all of Nebraska, all of South Dakota and North Dakota, the larger parts of Colorado and Wyoming, and nearly the whole of Montana—the total covering an area of 883,072 square miles. This excludes anything east of the Mississippi river, which once formed part of Louisiana, and which, by other treaties, had been comprised in the Florida cession. No part of the west slope of the Rocky mountains was included in Louisiana. The claim that it extended to the Rio Grande del Norte was strenuously disputed by Spain, and afterwards by Mexico, until Texas fought for and gained its independence, and was, seven years later, admitted into the American Union.

To return to our author. In Mexico he calls attention to the vast central table-land which, "with a gradual incline from the city of Mexico, 7350 feet above sea-level, stretches 1225 miles northward to El Paso, 3718 feet elevation. It is bounded on the one side by the *Sierra Madre Oriental*, and on the other by the *Sierra Madre Occidental*." But the former can scarcely be classified as a continuous mountain range; the country lying to the east of the one cordillera of Mexico, the "Occidental," presents here and there short isolated ridges, low mountain masses, and occasionally lofty hills. The long, smooth, gentle slopes of these and the vast valleys which lie among them, frequently hundreds of square miles in area, have often filled the writer of this review with reverential wonder at the lavish scale on which nature has hollowed them in all their sweeping immensity.

Ethnology occupies much space in Mr. Keane's book, and the origin, progress, and movements of Mexican races throughout Mexico, Central America, and the West Indies are treated with great skill and abundant knowledge of the subject. "In the north ruined cities are not numerous, and all the most imposing monuments, such as the pyramids of Cholula and Teotihuacan, are referred, by the Aztecs themselves, to their Toltec precursors, that is, as seen, to the Huaxtecan or northern section of the Maya-Quiché race. In the south, on the contrary, the whole land is thickly strewn with monumental remains—nearly seventy 'ruined cities' have already been described in Yucatan and neighbouring states, each stamped with a certain individuality beneath a generally uniform character, and all far more imposing than anything that can be traced directly to the Nahuas on the Anahuan plateau."

Mr. Keane mentions the last effort of the Central American States to form a union, which, however, was never carried into practical effect, and was dissolved in 1898. Nothing but a few thousand miles of railway and telegraph-lines could politically group these fragments of old Spanish colonies into a confederacy, having sufficient cohesive strength to command respect and obedience to law from each of its members.

Cuba, Puerto Rico, Hispaniola, and Jamaica are reviewed with a comprehensive description of their physical features, fringing reefs, uplands, plains, rivers, climate, flora, material and social conditions, and an outline of their stormy history. This is followed by a general survey of the Lesser Antilles, including the Bahamas, Bermudas, the Virgin islands and Santa Cruz, the Caribbee islands, and the outlying British Antilles.

Regret may be expressed that the industrial data and the commercial and financial statistics regarding all of these countries are not of more recent date.

In the concluding chapter the author finds himself at his best, and gives us an especially valuable description of the Guayanas, which, before the advent of the whites, were "little other than a geographical expression, with numerous variants of the name Guiana diffused over the whole region between the great bend of the Orinoco and the lower Amazon." It was "an ethnical word borne by a multitude of tribal groups belonging, either fundamentally or by assimilation, to the widespread Carib stock." Guayana embraces a vast region, which, owing to the connecting link between the Amazon and Orinoco, called the Cassiquiare canal, is known as the "Island of Guiana" (or Guayana), shared by Venezuela, Brazil, England, France, and Holland. "Out of this boundless domain was carved, in the per-fervid imagination of Sir Walter Raleigh, the 'Empire of Guaya,' whither his successor, Keymis, went in search of the fabulous Lake Manoa, where was a city 'the largest in the world,' in which dwelt the equally fabulous El Dorado." Had Keymis ascended the Essequibo instead of the Oyapok, "he might have reached a district about the low divide between that river and the Rio Branco," affluent of the Negro branch of the Amazon, "which has by some authorities been identified with the legendary Lake Parima, where dwelt the 'Man of Gold.' Here is the little Lake Amucu which, during inundations, communicates with both basins."

The coast-line of the Guayanas is nearly everywhere the same, but few feet above high water, a mangrove swamp in front, a morass behind extending inland about 20 miles, and constantly being raised "into an exceedingly rich alluvial belt which constitutes the only cultivated, and almost the only inhabited, part of the Guianas." Further inland is an old, elevated marine beach; and still penetrating the country, it rises in densely forested terraces, with occasional open savannas, until the low mountain ranges which divide the Atlantic slope from the Brazilian Guayana are reached, forming the water-parting between the northern and Amazon drainage; "but the seaward slope, lying between the savannas and the old marine beach, and comprising probably five-sixths of the entire area, is still uniformly covered with primeval forests, broken only by the narrow river-valleys and their numerous affluents ramifying in all directions." It is a roadless, uninhabitable, and almost intransitable region, except by painful canoe-navigation on the numerous rivers, which are broken by numberless rapids and cataracts.

Many countries, islands, and groups of islands have in this work come within the scope of the author's tireless powers of research and analysis, and it is only just to say that he has admirably acquitted himself of his arduous task by producing a 'Compendium of Geography' difficult to equal.

GEORGE EARL CHURCH.

HARRISSE'S NEWFOUNDLAND.*

IN this volume M. Harrisse continues his work, a work which some have well compared to chemical analysis—employed to force from the material of geographical history, within a given period, every secret of the inner meaning concealed within it. There are times, however, when it may be questioned whether the eminent scholar's forcing process is not too forcible, and whether we do not occasionally

* 'Découverte et Evolution Cartographique de Terre Neuve et des Pays circonvoisins 1497–1501–1769. Essais de Géographie historique et documentaire.' Par H. Harrisse. Paris: Welter, 1900.

receive therefrom something of dogmatic hypothesis, of arbitrary assertion or negation, as well as of hidden truth.

It is impossible, within the limits of a brief notice, to discuss the many and thorny controversial questions raised and settled by M. Harrisse with so much decision and appearance of finality in these *Essais*. The first necessity is to give some account of the questions themselves. Even where one can least agree with M. Harrisse (whose views, it must be remembered, have frequently undergone modification), his treatment will be found worthy of the closest attention. In an introduction of seventy-two pages, the author passes in review the early North American enterprises and conceptions of the English (ii.–xxi.); of the Portuguese (xxi.–xxx.); of the French, and especially the Breton, Norman, Rochellese, and other adventurers and designers (xxx.–liv.); of the Spaniards (liv.–lviii.); of the Basques (lviii.–lxv.); of the Netherlanders (lxv.–lxix.); and lastly of the Italians;—all so far, and so far only, as Newfoundland and the adjoining coasts are concerned. The body of the work is divided in two main sections: first, from Juan de la Cosa to Gaspar Viegas, 1500–1534 (pp. 1–131); second, from Jacques Cartier to James Cook, 1534–1769 (pp. 135–366). Finally, the results of the foregoing inquiries are summarized in ten pages (367–376) of a hundred and forty suggestive and often startling aphorisms. When all deductions have been made, it must be admitted that a number of interesting and valuable points have been elucidated, among which the following are perhaps the best supported and the most worth notice. First, from 1498 the discoverers of the new world, dissatisfied with the 'Asiatic' theory, began to prefer the idea of an absolutely new land, totally detached from Asia. Columbus himself inclined to this view before the end of his life, but many who had adopted truer notions soon fell back, for a time at least, into the old 'Asiatic' bondage, Portuguese and Dieppese cartographers and mariners being the chief exceptions to this reaction. Nothing has been more ably and minutely worked out here than this matter, so long neglected or misrepresented. The close maritime connections of Portuguese and Norman enterprise are shown by the fact that, at the commencement of the sixteenth century, the ports of Normandy and Brittany employed Lusitanian pilots for their ventures to Brazil and the Indies. Secondly, we are told, no one can fix where John Cabot sighted or coasted the North American shorelands in 1497 or 1498, but it is probable that the landfall of '97 was made at a point comparatively southern, that his subsequent exploration was from west to east, and that on his way he passed Cape Race. Here is a complete, and in some respects unconvincing, change from M. Harrisse's earlier position. His Labrador landfall has been shown to be untenable; now he appears to run into another false extreme. Thirdly, John Cabot gave Pedro de Ayala a map which was practically identical with the North America of La Cosa's chart of 1500. Fourthly, England, throughout the earlier sixteenth century, being profoundly disappointed with the results achieved by Cabot, Fernandez, Gonzalez, etc. (1497–1503), made no attempt after effective sovereignty in North America, took scarcely any interest therein, and allowed other nations to pre-occupy the ground. Thus no English map of North America in the sixteenth century shows anything but borrowed work, except for the arctic regions. The central part of Canada in, *e.g.*, Hakluyt's map of 1599, is borrowed from the chart drawn by Jacques Noel from Jacques Cartier's observations. Original English cartography of Newfoundland (signifying the Codfish Country in general, and comprising Labrador, Nova Scotia, etc.) only begins with Henry Southwood in 1675; English rights in North America, as derived from Cabot, Thorne, Elliott, etc., were first asserted by Dr. John Dee in 1578–80. Fifthly, the first European whose presence at Newfoundland is attested by documents was Gaspar Cortereal

(in 1500), from whose pilots were derived the earliest trustworthy elements for the cartography of these regions, as they appear in the Cantino map of 1502. Sixthly, the early expeditions to Labrador, down to 1541, were mostly due to the Portuguese; those to the neighbourhood of Cape Breton and Cape Race to the Bretons and Normans; while Portuguese and Dieppese cartography, from which Sebastian Cabot plagiarizes the Canadian section of his 1544 map, is the most valuable guide for tracing the growth of European knowledge of these regions; thus it is in the Nicholas Desliens of 1541 that the isle of Newfoundland first appears completely separated from Labrador, just as it is in the French explorations of Lieut. de Courcelle in 1675 that the above-named isle is first properly surveyed and laid down. In the third of these contentions, as to the—after all, conjectural—identity of La Cosa's indications with Cabot's own charts or notes, the author is surely too sweeping and too positive; in the fourth, fifth, and sixth he appears to have established his case with admirable thoroughness.

C. R. B.

GENERAL.

The Relations of Geography and History.*

This book is opportune, for the remarkable revival of interest in the study and teaching of geography as an introduction to the study and teaching of history has prepared the scholastic public to welcome treatises which bring out the connection of the two subjects in an intelligent way, illustrating it by numerous instances. That they are intimately connected is of course a very old idea. One finds it in Herodotus, as indeed one finds most things, for that most precious of all our ancient authorities was not more a historian than a geographer. But it is strange that so few writers, either in ancient or in modern times and down till about sixty or fifty years ago, should have given due emphasis to the relation of the two subjects, or dealt with that relation in a systematic and philosophic way. Hume, Gibbon, and Robertson, for instance, and still later, Hallam and Guizot, Macaulay, Ranke, and Giesebrecht, scarcely advert to it.

Mr. George has produced a useful little book, clearly written, and planned on a scale which makes it suitable for educational purposes. The first six chapters are general. The seventh deals with sea-power in peace and war, the eighth with geography in war. The rest contain illustrations of the general principles, given in the form of a treatment of different regions—viz. Europe, the British Isles, France, the Spanish peninsula, Italy, the Alpine passes (a topic which the author's long experience as an alpine-climber makes familiar to him), the Rhine-land, the Baltic region, the Danube basin, theatres of European war, the Mediterranean basin, and America. Most of these are well-handled, though some in rather too sketchy a fashion; but the chapter on America is scanty and weak. While usually sensible and judicious in his generalizations, Mr. George falls into a number of small mistakes, some of which it is well to adduce, that he may correct them in a future edition. He ascribes the Mohammedan use of the name "Frank" to designate Europeans to the time of the first Crusade (p. 58): it is really at least as old as the time of Luitprand. In asking why Moscow should have become a capital (p. 46), he omits all reference to the Kremlin hill. He says (p. 45) that "none of the various Persian capitals exist as towns," but Ctesiphon is practically represented by Bagdad. In referring to artificial capitals, he omits the remarkable case of

* 'The Relations of Geography and History.' By the Rev. H. B. George, M.A., Fellow of New College, Oxford. Oxford: at the Clarendon Press. 1901.

Ottawa. His remarks on the Khaibar pass (p. 26) are, if not erroneous, capable of being misunderstood; and he speaks as if the Khaibar and the Bolan were practically the only passes in that region, omitting the Gomul and the line of the Sind Pishin railway. He seems not to be aware that that railway, which he does not mention, has virtually superseded the Bolan line. He refers several times to the Carpathians as if they were a true and persistent mountain range like the Pyrenees, which they are not, being, indeed, to some extent a fiction of the map-makers. He says "there is nothing in favour of Madrid except its central position" (p. 49), without giving the reason why Charles V. made it his residence. "Spain, having no land frontier except France, is more likely to be permeated by French influence than any other" (p. 69). Nowhere, however, are the French so much disliked as in Spain; and the Pyrenees are practically a barrier to all land communication. The influence of France on Spain is chiefly due to the presence of many Spaniards in Paris. "The Phœnicians and the Jews dwelt side by side on the same coast, but they made very different uses of their opportunities" (p. 76). The Jews, during the flourishing period of the Phœnicians, really dwelt very little along the coast, being separated therefrom by Canaanite tribes. It is a serious over-statement to say (p. 155) "no physical frontier of more than a nominal character separates the region of the Garonne from the region of the Loire." An interesting passage (p. 150) points out the strategical importance, due to physical causes, of the region round Stirling in Scotland; but among the battles noted that of Sheriffmurie is strangely omitted, nor is there any reference to the great Roman military station at Ardoch. "The very title of kingdom of Italy is barely forty years old" (p. 192), but it ought to have been mentioned that there was a well-recognized "kingdom of Italy" in the earlier Middle Ages. It can hardly be said that "in the dominions still left to the Sultan the majority of the inhabitants are probably Greek" (p. 279), for the Greeks are not much more than a coast-fringe; neither is it true that "the Bulgarian people had been utterly swamped in the multitude of their Slav subjects" (p. 278); nor are the Bulgarians "probably a Turkish race," they are more probably Finnish; nor is it the fact that "with the exception of Marseilles, Greek settlements did not extend beyond Naples" (p. 281), for the colonies of Marseilles, such as Antipolis and Nicæa (Antibes and Nice), ought to have been mentioned, and Strabo tells us that Saguntum was originally a colony of Zacynthus. It is no longer true, since 1890, "that the whole of the population of the United States, save for the Irish element, is substantially Teutonic" (p. 284), for there has been a large Polish, Russian, and Czech immigration; nor is it quite correct to say that "the Alleghanies sink away into the plain at either end" (p. 284). A more serious error is the statement (p. 283) that "there have happily been no wars upon the frontier between Canada and the United States." And it is odd that in the chapters on mountains in connection with war, hardly anything is said of the important part played by gorges in the lower parts of mountains, *e.g.*, of the defile of Bard, in Napoleon's expedition across the Great St. Bernard.

The mention, however, of these and some other similar errors or omissions, must not prevent us from recognizing the general merits of the book. Its style is lucid and agreeable. It rectifies a good many current misconceptions. It contains many useful and pertinent remarks, such as those which point out how often political causes have, so to speak, overruled natural ones, and made the frontiers of states depart from the lines geography would have prescribed. Take it all in all, it may be recommended as a book fit to be used in colleges and the higher classes of schools, and one which any one who cares for history may read with profit and pleasure.

JAMES BRYCE.

EDUCATION.

Dryer's Physical Geography.*

This is the fourth new text-book on Physical Geography which has recently appeared in the United States. Like the others, it is suited for the higher classes of secondary schools, for pupil-teachers, and for the upper classes in evening schools. While the book is not so original as that by Profs. Davis and Snyder, it embodies most of the results of recent American research, and has the great merit of being arranged, on the whole, from an educational rather than from a purely logical point of view, so that the student passes naturally from one chapter to another. While we agree that the dynamics and morphology (or briefly the physiography) of the land can be taught effectively before that of the seas or of the atmosphere, we have grave doubts about the advisability of treating that of the sea before that of the air. We have no doubt, however, about the excellence of Prof. Dryer's method of beginning the treatment of each new chapter with a general description of the phenomena which are to be explained in it. The so-called realistic exercises are also, as a rule, very happily devised. The sketch-maps, distribution maps, and the other illustrations are numerous and well chosen, although acknowledgments to the sources from which the maps are taken are not given in every case.

The study of the land is begun by a consideration of erosion in general, which is immediately followed by three chapters on the Mississippi, Colorado, and St. Lawrence river systems, in which most of the river features the teacher wishes to emphasize are discussed. These three chapters and Chapter X., on the Drift Sheet of North America, are excellent examples of conveying physiographical and geographical instruction simultaneously.

This is one out of many examples of the art of the skilled teacher which are to be found in the book, which we cordially commend to teachers in this country who will appreciate its good points and profit by its fresh methods of treatment and fresh illustrations. A. J. H.

THE MONTHLY RECORD.

THE SOCIETY.

The Annual Awards.—The annual awards of the Society have been made as follows for 1902: The Founder's Medal to Brigadier-General Sir Frederick D. Lugard, for the persistent attention devoted by him to African geography, during his fourteen years' service in that continent, in countries very little known; the Patron's Medal to Major P. Molesworth Sykes, for his journeys in Persia extending over nine years, and for the support given by him to our native explorers, by both of which means our map-knowledge of Eastern Persia has been immensely improved; the newly-founded Victoria Medal to Mr. E. G. Ravenstein (the first recipient), for his efforts during forty years to introduce scientific method into the cartography of this country, and for his valuable researches on the geographical distribution of population,

* 'Lessons in Physical Geography.' By Charles R. Dryer, M.A., F.G.S.A. New York, etc. American Book Company. 1901.

the climate of tropical Africa, the history of geographical exploration, and other important subjects; the Murchison Grant to Mr. J. Stanley Gardiner, for his researches in Funafuti island, in the Pacific, and the Maldive islands, in the Indian ocean; the Gill Memorial to Mr. G. G. Chisholm, for the services rendered during twenty-five years to geographical education, and for his geographical investigations of various kinds; the Back Grant to Lieut. Amdrup, of the Danish navy, for his two voyages of exploration to the east coast of Greenland; and the Cuthbert Peek Grant to Mr. J. P. Thomson, founder of the Queensland branch of the R.G.S. of Australasia, for the services rendered, by his writings and in other ways, to the cause of geography in that state.

EUROPE.

Botanical Distribution in Ireland.—A laborious investigation of the distribution of the Irish flora has been carried out by Mr. R. S. Praeger, who has published the full results as a volume of the *Proceedings of the Royal Irish Academy* (Series iii. vol. vii.). The work was undertaken some six years ago, when the absence of detailed information concerning the distribution of plants in the island was brought to the notice of Mr. Praeger, who thereupon set himself the task of collecting exact data as to the distribution of plants by counties. In carrying this out he devoted five seasons to personal work in the field, obtaining also the co-operation of various other workers. The voluminous work now published is based on the new material so obtained, combined with previously existing information, and, though not laying claim to absolute completeness, forms a very full record of the distribution of Irish plants among the forty counties or portions of counties into which the author has divided the whole area. Consisting as it does largely of lists of plants with their localities, the work will be chiefly of value for purposes of reference, but the introductory chapters supply an instructive view of the general botanical features of Ireland and of plant distribution as affected by soil and climate. The work begins with a general sketch of the physical characters of the island, in which stress is laid on the predominance of Palæozoic rocks, and (in the north-east) Eocene volcanic outpourings; Mesozoic rocks, and the Tertiary sedimentary formations with their crumbling clays, light soils, and gravelly wastes, being almost entirely absent. The great central plain of carboniferous limestone, the calcareous character of which is shared by the overlying boulder-clay formed of its *débris*, is of much importance botanically, as are also the gravelly esker ridges—a remarkable feature of the central plain—and the bogs, which occupy 13·5 per cent. of the whole surface. The main topographic groups of the flora are laid down thus: (1) The typical plants of the south and west coasts belong to three remarkable groups—the first formed of plants which have their headquarters in the Pyrenees or along the Mediterranean shores, and which reach in Ireland a latitude higher than that which marks the limit of their range on the continent; the second, constituting a boreal, almost sub-arctic group, made up of plants whose home is in the northern United States and Canada; while the third consists of plants characteristic of alpine situations or higher latitudes in Great Britain. The presence of the two last is explained by the special climatic conditions which prevail along the west coast. (2) As might be supposed, the flora of the central plain is essentially calcicole, but is characterized also by marsh and bog plants which are cut off by the thick layers of peat from the calcareous sub-stratum. (3) The east coast flora differs from that

of the west both in the absence of the characteristic types above alluded to, and in the presence (especially in the south-east) of a number of plants of light soils, many of which, in the British isles, are essentially English. These features are due to climate as well as soil, the former being drier, with colder winters and warmer summers, than in the west. The flora of Ireland is thus especially characterized by the east and west contrast of its elements. Mr. Praeger also describes in more detail the special plants of calcareous regions, of the sea-coast, sandy and gravelly soils, bogs, marshes, rivers, and lakes, and calls attention to the profound influence which the operations of man have exercised on the flora.

ASIA.

A New Mountain Road from the Indus to the Kashmir Valley.—Major Bretherton, D.S.O., sends us an account of a journey undertaken by him last autumn for the purpose of exploring a more direct route between Chilas on the Indus and Bandipur on the Wular lake than the road in common use, *viâ* Ramghat and the Burzil pass (13,750 feet), which, though good, is very circuitous. Starting on September 21, with nine men and thirteen animals, as lightly loaded as possible, Major Bretherton marched on the first day 19 miles to Niat, the first 9 being along the good road leading to Abbottabad, the remainder on a rough country path which diverges from the road to the left. Apart from the shaky cantilever bridges, no particular obstacles were met with on this march. At Nias the party was joined by two Sepoy guides of the Chilas levies, but one of these declaring himself unwell, it was decided to proceed with one only, Major Bretherton's orderly stating confidently that he knew the way thoroughly. On September 21 the march was resumed towards the Fasat pass, the track passing several awkward places, and after three hours' plodding snow began to fall, soon obliterating the path. It presently developed into a regular blizzard, and to add to the difficulties the Sepoy guide bolted, while on arriving at an amphitheatre of deep snow, from which five separate ravines led up to the crest-line, the orderly confessed to uncertainty as to the way. The party had been already three and a half hours in snow reaching above the knees, and as it was impossible to see more than 20 or 30 yards, the men became dispirited. There was nothing for it but to examine each of the five ravines, and after two hours' searching, a break in the cloud revealed the way to the pass. At the top of a difficult slope a snow cornice, some 10 feet high, blocked the way, and it was necessary to cut a path on to the crest; but this was at last accomplished, and the animals led triumphantly over. The height of the pass is stated by Captain Beazeley, R.E., who has recently surveyed the ground, to be 15,200 feet. At 7.30 p.m., after more difficulties, camp was pitched on a bleak, uninhabited spot, near the head of the Barai ravine, all of the party suffering more or less from snow-blindness and swollen faces. On the 22nd the Barai pass (14,250 feet) was ascended by a steep snow-slope, down which one of the ponies was precipitated quite 1000 feet without material injury. A descent was made into the Kel valley, and a sheep-track found which led to a few huts at Mori. Here camp was pitched after a harassing march of 15 miles, 7 of them on snow. At 12½ miles down the valley from Mori, the Kishanganga river was struck (September 23), and ascended to the bridge leading over to the track up the Matsil ravine. Some dangerous places were passed, and the bridge, which hangs at a height of 55 feet over the torrent, with a span of 90 feet, proved a rickety structure, but was crossed in safety. The track up the Matsil ravine was most difficult for animals, but at 6.30 a halt for the night was made at a desolate grassy glade called Chhoti Dakki. On the 24th, Major Bretherton left the baggage and struck out for Bandipur, ascending the Matsil ravine past the village of the same name, and crossing the

ridge separating it from the Lolab valley in Kashmir, whence the Wular lake was reached by the road across the Nagmarg range. The total length of this day's march was 46 miles. Major Bretherton estimates the distance by the new route at 116 miles, as against 196 miles by the usual route. During the journey he noted minutely all the alterations necessary to convert the track into a practicable road for laden animals in case the authorities should consider such a course advisable. The difficulties experienced were partly due to the lateness of the season.

North-West Baluchistan.—In part ii. vol. xxxi. of the *Memoirs of the Geological Survey of India*, Mr. E. Vredenburg gives a description of the country between 28° 30′ and 30° N., and between 60° 30′ and 66° E. South of the Helmand river is a great desert plain, with a few irregularly scattered groups of hills of horizontal or slightly bent strata, succeeded in the southern half of the region in question by concentric ranges of mountains concave to the north. These ranges are highly folded and closely set in the west and east, and strike north-west in the west at Kóh-i-Malik-Siáh, and north-east in the east at Nushki. The intermediate ranges are separated by broad desert plains on the inner side, strewn with black pebbles where not invaded by sand-dunes, and probably indicating regions of subsidence; and the ranges reveal "scaly structure," thrust-planes, and overfolds, the thrust being towards the depressed areas, whether north or south of the mountains. The rocks are of the same age and composition in both the slightly disturbed desert and much contorted mountain areas, and consist of shales, sandstones, and limestones of Upper Cretaceous to Upper Eocene age, often containing an enormous proportion of volcanic material, and in addition granites, syenites, diorites, while some more basic dykes have been intruded not earlier than the Eocene. On the margin of the desert plains near the tall ranges Siwalik formations dip towards the ranges which they fringe. This is an area of inland drainage, with irregular and ill-defined basins, where water seldom reaches the sun-cracked alluvium of the old lake-bottoms (*hamuns*). After a rare shower the water runs for a few hours in parallel furrows, often of unequal depth, which disappear after 5 or 6 miles in the plain. These are not V-shaped, but shallow, flat-bottomed troughs with steep sides. Where rainfall is heavier, some ranges are cut through by narrow gorges (*tangi*), which may be the outlet of a comparatively large area within the mountains, but beyond the last ridge the waters distribute themselves over an alluvial fan. The talus of conglomerate formed by coalescent fans forms a skirt (*daman*) to the mountain, which may reach to very considerable heights. The daman is naturally variable in composition, and water is stored in the permeable coarser and less movable deposits, whence it is drawn by artificial underground channels (*káréz* in Baluchistan, and *kanát* in Persia), and by sinking artesian wells to form oases (cf. Oldham, *Rec. Geol. Surv. Ind.*, xxv. (1892), pp. 36–53). When the rainfall is heavy enough, boulders are carried to the plain and form the stony deserts, or *dashts*. Only a few streams, *e.g.* the Lora, Mashkel, and Tahlab, are large enough to form a channel on the plain, and as a rule the water gathers into shallow pools, which, when they dry up, leave a light-coloured mud deposit called *pat*, the most barren parts of the desert where not irrigated. The hamuns are but pats writ large, *e.g.* the Lora Hamun. An unusually deep pool may form a perennial sheet of water called a *nawar*, whose banks are studded with tamarisks, beyond which is a cultivated oasis. "The depression in which are collected the waters of the Helmand basin affords an instructive illustration of the uncertain manner in which hydrographic basins are defined in a desert region. The waters of the Helmand and of several rivers flow into two shallow fresh-water lakes surrounded by a reedy swamp. Sometimes the lakes overflow into this marsh, and thus become united. The fertile plain of Seistán proper is but the delta of the Helmand,

and has been formed partly by the sediments carried by that river into a lake which formerly occupied the entire depression, and partly owing to the desiccation of the lake itself. The *hamuns* and marshes that still exist are separated in ordinary seasons by a low watershed from the southern and lowest part of the depression, which contains the Zirreh lake. Thus, in ordinary seasons the Gaud-i-Zirreh is the centre of a basin absolutely distinct from that of the Helmand, . . . but when the flood of the Helmand is exceptionally abundant, the water of the combined lakes of Seistán rises to the level of the low watershed, and flows through the channel of the Shelag river into the Gaud-i-Zirreh."

Distribution of Vertebrata in India and the Neighbouring Countries.—The Royal Society has recently published an important paper by Dr. W. T. Blanford on the subject of the distribution of vertebrate animals in India, Ceylon, and Burma (*Philosophical Transactions*, Series B, vol. 194, pp. 335–436, Map).* The author's object is to determine the natural divisions of the Indian Empire on the basis of our present knowledge of the vertebrata, and especially to ascertain the zoological relations between the Indian peninsula and the neighbouring countries. The plan adopted for the study has been to divide the whole country into nineteen tracts, distinguished by physical characters—such as rainfall, temperature, presence or absence of forests, and prevalence of hilly ground, and to construct tables showing the distribution of each genus of land or fresh-water vertebrates in the tracts. The preliminary subdivision of the whole area is the following: A. The Indo-Gangetic plain. B. The Indian peninsula. C. Ceylon. D. The Himalayas. E. Assam and Burma. A review of the fauna of the tracts leads, among others, to the following conclusions: I. The Punjab tract differs so greatly in its fauna from the Indian peninsula and from all countries to the eastward, that it cannot be regarded as part of the Indo-Malay or Oriental region. All genera met with in the Punjab tract and wanting further east, are either Holarctic forms or peculiar, but with Holarctic affinities. II. The Himalayas above forest range, together with such portions of Tibet as come within Indian political limits, belong to the Tibetan subregion of the Holarctic region. III. India proper from the base of the Himalayas to Cape Comorin, and from the Arabian sea and the eastern boundary of the Punjab tract to the Bay of Bengal and the hills forming the eastern limit of the Gangetic alluvium, should, with Ceylon, be regarded as a single subregion, which may be termed the Cisgangetic subregion. The Cisgangetic fauna differs from the Transgangetic more especially in the batrachians, of which half the genera are distinct in each. The difference between the Cisgangetic fauna and that inhabiting the rest of the Indo-Malay or Oriental region is shown to consist partly in the absence in the former of numerous Eastern types, and partly in the presence of two constituents besides the Oriental genera. One of these constituents consists of mammals, birds, and reptiles, having a direct relationship with Ethiopian and Holarctic genera, and with the Pliocene Siwalik fauna; it may be distinguished by the term Aryan. The other is composed of reptiles and batrachians, and may be termed the Dravidian element. This is pointed out as being probably the oldest part of the Cisgangetic fauna, and may have inhabited the country since India was connected by land with Madagascar and South Africa, across what is now the Indian ocean, in Mesozoic and early Cenozoic times. Another peculiarity of the Indian peninsula fauna is the presence of genera and species which are found on both sides of the Bay of Bengal, but not in the Himalayas or Northern India. IV. The forest area of the Himalayas belongs to the same subregion as Assam, Burma (except south

* Abstract in *Proc. Royal Society*, vol. lxvii., No. 441, pp. 484–492.

Tenasserim), Southern China, Tonkin, Siam, and Cambodia, to which the term Transgangetic may be applied. The fauna of the Himalayan forest area is partly Holarctic, partly Indo-Malay, and is remarkably poor, when compared with the Cisgangetic and Burmese faunas, in reptiles and batrachians. The Oriental element in the fauna is richly represented in the Eastern Himalayas, and gradually diminishes to the westward. These facts appear to be consistent with the theory that the Oriental constituent of the Himalayan fauna has migrated into the mountains from the eastward at a comparatively recent period. V. Southern Tenasserim agrees best in its vertebrata with the Malay peninsula, and should be included in the Malayan subregion of the Indo-Malay region. The author points out that many of the remarkable features in the distribution of Indian vertebrates may possibly have been due to the Glacial epoch.

Altitudes in Asiatic Russia.—Prince Kropotkin writes to us as follows on this subject: "The Russian Geographical Society has lately issued, in the *Memoirs for General Geography*, vol. xxxi. 2, a very useful work by Dr. Hikish, entitled 'Catalogue of Altitudes in Asiatic Russia and some Adjacent Portions of Asia,' on the basis of the data published down to 1894. There formerly existed only one catalogue of altitudes in Eastern Siberia and parts of Mongolia, which was compiled and calculated by myself in 1872, and contained altitudes of 870 different spots. Numerous barometrical observations have been made since, especially in Turkestan and Western Mongolia, but they remained scattered in the publications of the Geographical Society, as well as in different volumes of travel, both Russian and English. Suffice it to say that if we exclude from Dr. Hikish's catalogue those altitudes which were included in the former work, there remain over 9000 altitudes which are now catalogued for the first time, to which A. A. Tillo, who had begun editing this volume shortly before his death, added 1130 more, thus bringing the grand total to 11,629 separate determinations. It must be remembered, however, before making use of this catalogue, that the altitudes are given in it such as they were published by the different calculators, all of whom have taken widely different altitudes for the fundamental points of their respective catalogues. Thus the Kropotkin catalogue was based on the following fundamental altitudes: Irkutsk, 1285 feet (level of Angara, 1255); Nerchinsky Zavod, 2012; Krasnoyarsk, 408; Lena at Yakutsk, 214; Tikhono-Zadonsk mine, 2185 feet. However, the altitude of Irkutsk still remains unsettled, as it was thirty years ago. According to the great levelling which was made across Siberia, and the results of which were published in 1888 by W. Fuss, the altitudes of different spots at Irkutsk are 1484 and 1521 feet (this last for the Church of the Holy Cross), and the altitude of the Angara is 1470 feet. The same levelling gives 498 feet for Krasnoyarsk, and 450 feet for the level of the Yenisei at that town. Now, it has already been mentioned in the *Izvestia* of the Russian Geographical Society that a serious mistake has crept into the levelling between Krasnoyarsk and Irkutsk, and that, owing to it, the altitude of Irkutsk (1520 feet), as well as of the Angara at Irkutsk, is taken too high. Such an error seems the more probable, as the railway levelling between Krasnoyarsk and Irkutsk does not give for the capital of East Siberia so great an altitude, and, as has already been pointed out once in this *Journal*, the extremely great heights of the barometer which are sometimes observed in winter seem to point to an error in the same direction. In all probability, the altitude of Irkutsk—*and consequently of Lake Baikal*—is taken about 100 feet too high. It would be most desirable that this point should be definitely settled, the more so as the scientific value of the Catalogue, just now published by the Geographical Society, would be considerably increased, if the present uncertainty of from 100 to 200 feet in the altitude of Irkutsk—and of thousands of other spots

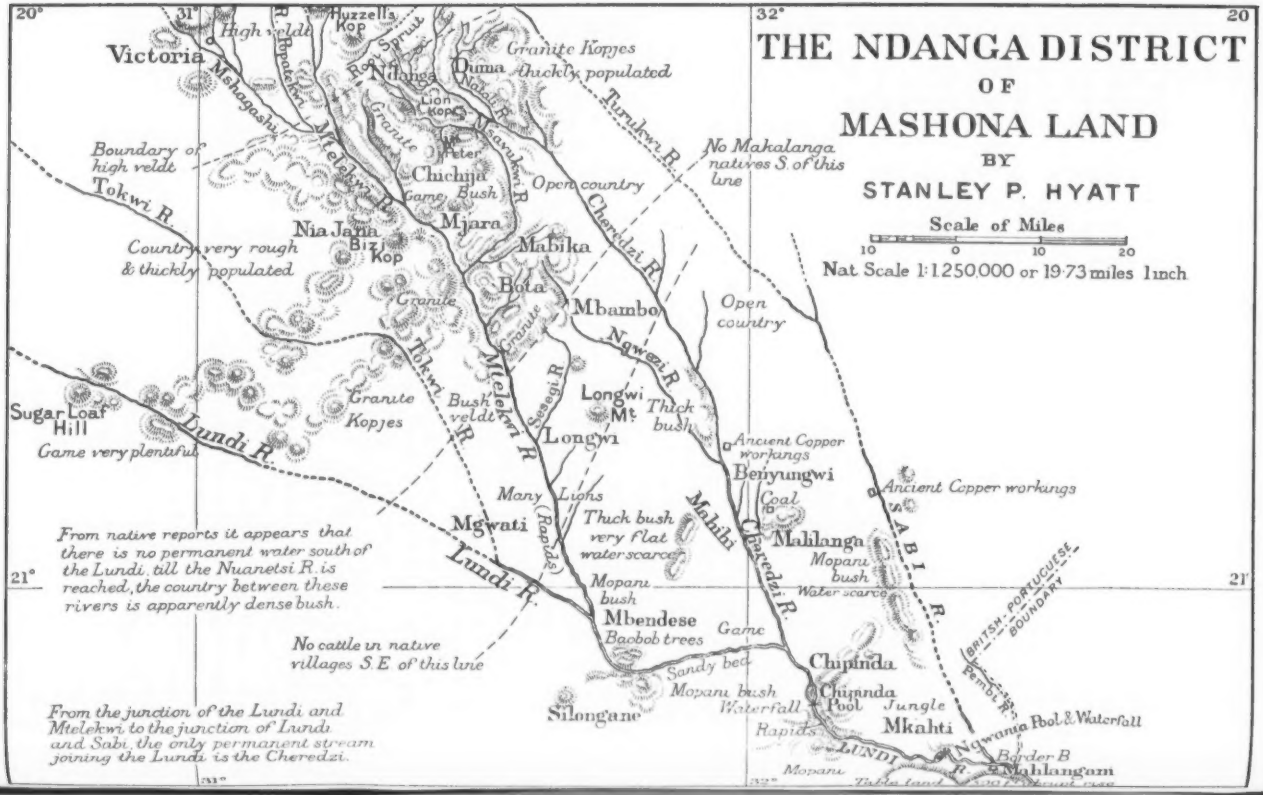
based upon the altitude of the East Siberian capital—were definitely removed before the original railway levellings have been forgotten or lost. Let us add that the catalogue is very well edited, and contains two most valuable alphabetical indexes, one of all the altitudes, and another of the authors."

The Narym Region.—The ninth volume of the statistical section of the *Memoirs* of the Russian Geographical Society contains a valuable paper, by A. Th. Plotnikoff, on the Narym region of the government of Tomsk, with a map. The work is chiefly ethnographical and statistical, and contains a detailed description of the inhabitants—Russians, Ostyaks, and Ostyak-Samoyedes—preceded by a good physical and geographical sketch of the country and an historical sketch of its conquest and colonization. The Narym region is a very interesting remnant of a sea which covered the lowlands of Western Siberia in Post-Pliocene times. It is a level plain, nearly 100,000 square miles in extent, the highest portion of which, the Vas'yugan tundra (30,000 square miles), barely rises 500 feet above sea-level. This last occupies the watershed between the Ob and the Irtysh, and represents an immense marsh, which, during the period of inundation by the rivers, becomes a vast lake, described by the inhabitants as "the Vas'yugan sea." In ordinary times this immense marsh is covered on its surface with a floating carpet, composed of decaying vegetable matter, clothed with grass in summer. Small knolls, called *tomars*, composed of decayed rough grasses and dry stems of wood, and covered with low growths of birch (seldom more than 1 or 2 feet high), rise amidst this floating carpet; they are also not rooted in the ground, but float on the surface of the marsh. Petrified wood—we are told—and horns (of reindeer?) are occasionally found in these knolls. The surface of the tundra is usually dry in summer; but as the carpet of vegetation floats over the surface of the marsh, water appears as soon as pressure is exerted upon the floating carpet, often under the pressure of man's foot. The Ostyaks cross it by laying three poles on its surface, and moving two of them at every four steps. Where the tundra is dry no such aids are necessary, but it is as difficult to march over it as over a sandy desert. Bears and reindeer find no difficulty in crossing the tundra, and yet the natives say that the bear occasionally finds difficulties, and in such case carries with him a piece of wood. Uninhabitable though such a territory may seem at first sight, it has nevertheless its inhabitants, who find their means of living in the immense forests, which supply furs and cedar-nuts, and in the rivers, which teem with fish. Evidently it is only along the courses of the rivers that the villages can be built, and yet we find in these inhospitable tracts nearly 5350 Russians—nearly all peasants—and about 3500 natives. The latter are, however, on the decrease, as they numbered 7500 in 1805. The work has a map on the scale of 27 miles to the inch.

A Journey across Sumatra.—It is stated in the *Deutsche Rundschau für Geographie* that a small military column under Major Van Daalen, while engaged in operations against the claimant to the throne of Acheh, has succeeded in crossing Sumatra through the almost unknown territory of the Gajus, a tribe which has in the past shown itself hostile to the Dutch authorities.

AFRICA.

The Ndanga District of Mashonaland.—Mr. Stanley P. Hyatt sends us the following account of the Ndanga district of Mashonaland, which stretches south-east from Fort Victoria, and includes the zone of broken picturesque country by which the dreary high veldt passes into the flat, waterless, and bush-covered plains which extend to the Portuguese border. This belt of mountainous country, which runs south-west towards the Crocodile river, has here a width of about 60


THE NDANGA DISTRICT
OF
MASHONA LAND
BY
STANLEY P. HYATT
Scale of Miles
10 0 10 20
Nat. Scale 1:1,250,000 or 19·73 miles 1 inch
20°
31°
32°
21°
Victoria
High veldt
Huzzell's Kop
Sprut R.
Ndanga
Lion Kop
Duma
Granite Kopjes thickly populated
Natal R.
Turuikwi R.
No Makalanga natives S. of this line
Boundary of high veldt
Tokwi R.
Mtelekwi R.
Msaruko R.
Chichija
Game Bush
Open country
Cheredzi R.
Nia Jana Bizi Kop
Mjara
Mabika
Country very rough & thickly populated
Bota
Granite
Mbambo
Ngwezi R.
Open country
Tokwi R.
Mtelekwi R.
Sesegi R.
Sugar Loaf Hill
Game very plentiful
Granite Kopjes
Bush veldt
Longwi Mt.
Thick bush
Longwi
Ancient Copper workings
Benyungwi
Coal
Ancient Copper workings
Lundi R.
From native reports it appears that there is no permanent water south of the Lundi, till the Nuanetsi R. is reached, the country between these rivers is apparently dense bush.
Many Lions
Mgwati
Lundi (Rapids)
Thick bush very flat water scarce
Mahibi
Cheredzi R.
Mahlanga
Mopani bush
Water scarce
SABI R.
BRITISH-PORTUGUESE BOUNDARY
Mopani bush
Mbendese
Baobob trees
Game
No cattle in native villages S.E. of this line
Sandy bed
Mopani bush
Waterfall
Chiminda
Chiminda Pool
Jungle
Silongane
Rapids
Mkahti
Ngwania Pool & Waterfall
LUNDI R.
Border B
Mahlangam
Mopani
Tuba land
From the junction of the Lundi and Mtelekwi to the junction of Lundi and Sabi, the only permanent stream joining the Lundi is the Cheredzi.

miles, and ends abruptly with a drop of several hundred feet. Huge masses of granite are intersected by fertile valleys, traversed by streams of clear water, and all available land is either cultivated or used for grazing purposes by the natives, who are pure Makalanga. In the arid bush veldt the population consists of small communities of Mahlinga, scattered along the banks of the larger rivers, who, before the Zulu invasion early in the last century, occupied the whole country as far as the coast. The Makalanga grow large crops of "mpoko," a small red grain resembling rape-seed, and, in the lower parts of the kopje country, excellent tobacco. They possess considerable numbers of black cattle, small, but beautifully built, and very hardy. The Mahlinga grow comparatively small crops, and possess practically no cattle; but their sheep and goats are much superior to those of the Makalanga. Under the present settled *régime*, which has put a stop to the former raids of the Matabele and Mchangana Zulus, the Makalanga are increasing rapidly, and, though at present quiet and contented, may possibly give trouble in the future. Individuals with decided Semitic features are common among them, and, but for their dark skins, might be taken for Levantine Jews. This cast of face seems to be of the nature of an occasional reversion to the type of an alien ancestor. The customs and traditions, and especially the sacrificial rites of the Makalanga, are interesting, and their language differs from that of their neighbours in having no "click" sounds. The Mahlinga have copied the dress and customs of the Mchangana, and speak a kind of bastard Zulu. Their country seems to have been once invaded by the Portuguese, as traditions exist of a force of white men having been cut up by the natives between the Mtelekwi and Ngwezi rivers, long before the advent of the Zulus. In the mountainous country there are large belts of Mahobba-hobba trees, with straight trunks and soft but durable wood, used for building purposes; but otherwise the trees are stunted and of little value. Much of the surface is covered with bracken, which seems identical with the English species. In the bush country large areas are occupied by mopani trees, which often attain a large size. In the angle between the Sabi and Lundi rivers, the bush becomes a veritable jungle, with dense undergrowth. The ground here is stony, with practically no grass, but in some parts of the bush country there is a coarse grass, from which the natives extract salt by burning. Game of all sorts abounds in the bush country, including antelopes of many kinds, wild pig, elephants (in the neighbourhood of the Portuguese border), while lions, leopards, and hyænas give much trouble. Buffalo are practically extinct west of the Sabi. Huge fish are found in the pools of the Lundi, the so-called "barbel" sometimes scaling 60 lbs. In the dense bush near the Portuguese frontier, there is a species of guinea-fowl which is apparently unknown to naturalists. It is larger than the common variety, and the head is covered with a large crest of white feathers, while the skin of the face and neck is a brilliant red. The spots are very small, and of a bright metallic blue. Important discoveries of coal and copper have lately been made near the Cheredzi and Sabi rivers. The former occurs in a sandstone formation, and the outcrop is large, but of a poor quality, though improving at a slight depth. The copper has been extensively worked by the ancients, the workings taking the form of huge quarries, sometimes 500 feet in length.

Mountain Flora at the Cape.—Dr. R. Marloth, who a few years ago collected botanical specimens from some of the higher peaks in the south-west of Cape Colony, gives the results of his investigations in the *Transactions of the South African Philosophical Society* (vol. xi. part 3, 1901). In ascending the higher mountains, *e.g.* the Great Winterhoek, near Tulbagh, the last arborescent shrubs are passed at about 4000 feet, while higher up only low shrubs of heath, composites, *Bruniaceæ*, *Rutaceæ*, etc., cover the slopes, becoming gradually smaller

and more compact. It is only, however, when about 6000 feet is reached that types of alpine character appear, and of the comparatively few summits which exceed that height in the south-western district of the Cape Colony, few have yet been explored botanically. Dr. Marloth collected from five peaks above 6000 feet, securing seventy-two species, of which he enumerates the names, though these do not constitute the whole flora. He points out that, owing to the general xerophytic character of the plants at the Cape, and the consequent need of such differentiation as may guard them against excessive transpiration, one of the usual distinctions between the vegetation of higher and lower regions is wanting. The general composition of the higher flora is practically the same as that of the lower slopes and valleys. It includes a few species known from the plains below, a number of others known from the foot of the mountains, and some, *e.g. Erica sebana* and *Anemone capensis*, which are also found at or below the altitude of Table mountain, 3549 feet. In several cases, however, the specimens from the high regions represent distinct varieties, if not new species, and the characteristic stunted and cushionlike growth of alpine plants is often noticeable, while all plants with permanent foliage are thickly covered with hairs. It must be remembered, also, that our knowledge of this flora is still incomplete, and that a number of truly alpine types may yet be found.

Baron von Stein's Expedition in the Southern Kamerun.—This important expedition, of which some account was given in the February number of the *Journal*, has now been brought to a successful conclusion, and details of the return march, in great part by new routes, are given in the first three numbers of the *Kolonialblatt* for the present year, accompanied by an excellent map. The further results seem entirely to confirm Baron von Stein's statements as to the course of the Ja and the general geography of the region. A *détour* was made to the south for the purpose of visiting the Bule countries on the southern limb of the great bend of the Ja, of the identity of which with the Ngoko there seems now no doubt. Rapids were found, as previously reported, on this section of the river, and a fall of some 25 feet also heard of, but there are considerable stretches in which the river may prove useful as a means of communication. The country as a whole shows little variation of level, and even on the water-parting between the two sections of the Ja the highest point is only some 500 feet above the rest of the surface. Much progress has been made towards opening direct commercial relations with the coast, and the Nyem tribes show a desire to deal direct with the white men, their ivory and rubber being at present forwarded to the Batanga coast through the intervention of the Bule. From Bijum, in the Nyem country, Baron von Stein made a wide circuit to the north, reaching the important town of Bertua, reached by Dr. Pleyn on his last disastrous expedition. The route led across the source region of the Ja, Bumba (the other branch of the Ngoko), Nyong, and Dume, the last-named being an important branch of the Kadei or western headstream of the Sanga, and valuable information as to the hydrography of the region was obtained, by which considerable alterations will be introduced on our maps. It was also found that the forest region extends further north than had been supposed. Baron von Stein's account contains much interesting information on the native tribes met with, as well as on the present and future possibilities of trade, which in the northern parts of the region is at present in the hands of the Hausas, whose influence is firmly established at Bertua. He recommends the introduction, as currency, of pieces of brass wire, such as are in use on the middle Congo. The numbers of French five-franc pieces imported has so depreciated the silver currency that the franc now stands at only one hundred, or at most two hundred, cowries in value.

Exploration in French Congo.—News has lately been received in France of the successful termination of a journey of exploration between the Sanga and Ubangi, undertaken in July last by M. Dessirier de Pauwel. The result of the journey is to extend the knowledge of the Bali, partially explored, as already announced in the *Journal*, by MM. Fredon and Cadenat. From the Bangi station M. de Pauwel went through the Bonjo country to the Lobai (of which the Bali is the upper course), afterwards proceeding north by that river to Carnot on the Sanga. The Lobai is said to be an important stream, and to have three upper branches in addition to the Bali.

Results of the German Pendulum Expedition in East Africa.—During the course of the German Expedition in East Africa under Lieut. Glauning and Dr. Kohlschütter, an outline of the work accomplished was from time to time given in the *Journal* from the preliminary reports of the travellers. A fuller account of the results of the expedition from a geographical point of view was last year given by Dr. Kohlschütter at the "Geographentag" at Breslau, and is now printed in the proceedings of the meeting (also issued separately as a reprint). The first part of the paper deals with the cartographical results, some of which have already been recorded in the *Mitteilungen aus den Deutschen Schutzgebieten*, and referred to in the *Journal*. The most important are those obtained by triangulation in the mountainous districts north of Lake Nyasa, especially on a line crossing the Ukinga mountains of the station of Nasaurua. Dr. Kohlschütter urges the importance of more accurate surveys, and alludes especially to the difficulty which exists of fitting together surveys of different districts in the absence of a knowledge of the varying deviations of the plumb-line from the vertical, which show considerable differences in short intervals. The most interesting part of the paper is, however, that dealing with the rift-valley systems of East Africa, the study of which, in relation to possible disturbances in the force of gravity in their neighbourhood, such as have been found to exist on the shores of the Red sea, formed the main task of the expedition. The observations have not yet been worked out sufficiently to allow a statement of results from this point of view, but the work of the expedition has thrown new light on many points connected with the morphology of the rift-valleys which are of much interest. Like Bornhardt, Dr. Kohlschütter shows that the Nyasa rift-valley bifurcates at the north end of the lake, but he points out also that there is an additional fault-scarp running parallel with Nyasa on the east of the Kinga mountains, and also that the north-western main branch —that of Lake Rukwa—leaves the Nyasa trough by two separate arms, separated by the uplands of Nyika, the more southerly of the two, which follows the line of the Songwe, Nkana, and Saisi valleys,* being defined on its south side by the northern escarpment of Mount Waller. Further north the Rukwa trough can be traced distinctly to its junction with that of Tanganyika (a fact already hinted at by Mr. Hore, though since denied by Mr. J. E. Moore), the apex of the Fipa plateau, which lies between the two rift-valleys, occurring at Karema. The Rukwa valley appears to be continued westward in the Lukuga gap on the west of Tanganyika, and has thus been intersected by the later subsidence of the latter. Rukwa must, therefore, like Tanganyika, have been occupied by a Jurassic sea, if Mr. Moore's theory is accepted, and Dr. Fülleborn has found indications that it too contained a special fauna. As regards the rift-valleys between Victoria Nyanza

* It was suggested in the *Journal* for 1896, in a review of Dr. Gregory's 'Great Rift-valley,' that the Nyasa trough might be continued north-west by the Songwe and Saisi valleys, though the idea was criticized at the time by a writer in the *Zanzibar Gazette*.

and the coast, several important facts were brought to light. It seems probable that the Nyarasi or Eyassi trough is continued eastward across the main rift-valley, while a parallel trough—that of Sale—seems to exist to the north, intersecting the main valley at the Natron lake. Both of these have their floors formed of horizontal deposits which give evidence of having been laid down in old salt-lakes. The main rift-valley is at a decidedly lower level than that of Nyarasi at the point of intersection, and it thus lays bare a section of the latter. Its comparatively recent origin receives fresh confirmation from the fact that its subsidence has carried with it the half of a volcano situated on the floor of the Sale trough.

AMERICA.

Forty-mile, Yukon Territory.—Mr. G. L. Gordon, headmaster of the St. James' Diocesan School at Forty-mile, Yukon Territory, sends us an account of that remote settlement lying almost on the arctic circle, and forming the most north-westerly settlement in the British Empire. The Forty-mile creek, on the delta of which the town stands, is well known as traversing some of the richest of the recently discovered gold-fields, but its site was frequented from about 1858 by the old fur-traders, who had here their "Fort McQueston." At present some 100 to 150 miners are working the bars in its vicinity, and make the town their depôt for supplies, while on an adjoining island is a settlement of fifty to sixty Indians under the Church Missionary Society. No very good character is given to them, as they are said to be superstitious, and when out of control of the missionaries addicted to drink, while stubbornness, pride, selfishness, and ingratitude are put down as prominent traits. Other tribes, known as "Tanarias," from the hills near which they live, have villages up the creeks, and are far more intelligent than the river people, and do a large trade in furs. Apart from gold the country's resources are slightly developed, though coal, copper, and other metals exist, and some coal is worked. At Coal creek, some 10 miles below Forty-mile, about 2000 tons were turned out during the last season. The agricultural resources are said to be sufficient, if developed, to supply twice or three times the present population of the country. Vegetables and cereals, as well as garden flowers, can be grown successfully, and Mr. Gordon sends details as to his own attempts at cultivation, which prove the luxuriance with which plants grow during the summer months. The fact that at 3½ feet below the surface the soil is permanently frozen is said to be rather advantageous than otherwise, as helping to retain the moisture during the long summer days with hot sun for twenty hours. Game is abundant and fresh meat plentiful, and the Yukon salmon are a great resource both to whites and Indians. Rats and mice are a plague, but with the recent introduction of cats (which have sold for $25 a piece) they have become scarcer. Horses and oxen are being brought in, and will soon supersede the dog as a beast of burden. The neighbourhood of Forty-mile has, owing to its sheltered position, cooler summers and warmer winters than many other parts of the country. From May to September the temperature varies between 70° and 90°, while in December, January, and February, anything from 10° to 58° below zero may be expected. From October to April there is little or no rain, and after November very little snow; but rain is generally abundant from April to August. The Yukon is not fully closed by ice till the middle of November, and breaks again about May 15, the break-up generally causing a flood somewhere along its course. In 1901 a dangerous flood occurred at Forty-mile for the first time for many years, and the sudden breaking of the ice is described as the grandest sight ever witnessed by the writer. Houses 20 feet above the river-bank (itself 25 feet above the ordinary water-level) were flooded, forcing the whole population to take refuge on a ridge outside the

town, and damage to the amount of £25,000 was done to the town. After this flood, frogs, which had before been unknown in the place, made their appearance for the first time. Forty-mile is the extreme post of the North-West mounted police, whose duties are very onerous, including all the custom-house and post-office work for the whole district. It is connected by telegraph with Dawson and with Eagle in Alaska, and since September last with British Columbia.

The Delaware Ship Canal.—The narrowness at its northern portion of the great tongue of land which separates Chesapeake bay from Delaware bay, and the existence on either side of it of such important cities as Baltimore and Philadelphia, are facts sufficiently striking to have drawn attention to the feasibility of a ship canal as far back as the beginning of the last century, and the subject has again been brought into notice by the recent introduction into Congress of a Bill asking for the appointment of a Commission to examine and report upon the various routes, and to authorize the construction of a ship canal at a cost not exceeding £2,000,000. It is anticipated that with a sea-level waterway capable of taking large vessels, and with a minimum depth of 30 feet, a great saving of time could be effected. The transit would probably take from fifteen to nineteen hours, but it is noticeable that the shipping community does not seem to regard the project very favourably, holding that with probable delays and the infliction of tolls and dues there will be little saving either in time or money.

POLAR REGIONS.

Danish Expedition to Greenland.—An expedition for the thorough study of the peoples of Greenland, their sociology, folklore, etc., has been organized in Denmark, and is to start for the scene of operations about the middle of June. The members of the expedition will be—Mr. Mylius Erichsen, a well-known writer, to whom the idea of the undertaking is principally due; Lieut. Count Harald Moltke, artist; and Mr. Knud Rasmussen, a native of Jacobshavn, in North Greenland, who has a thorough knowledge of the Eskimo language and will act as interpreter, besides undertaking a special investigation of the folklore and inner life of the natives. The expedition, which is the first that has been undertaken for the special objects in view, has the cordial support of the Danish State Commission for Greenland research, composed of Rear-Admiral Wandel, Dr. Steenstrup, and Commodore Holm, as well as of such arctic specialists as Dr. Nansen, Commodore Jensen, Captain Garde, Lieut. Amdrup, and others. Mr. Mylius Erichsen has for some time devoted himself to a study of existing literature on Greenland and its people, while Count Moltke has had former experience of Arctic travel with Dr. Steenstrup and Mr. Adam Paulsen. It is proposed eventually to publish the results in a fully illustrated narrative for the general public, together with special memoirs on the people and their mode of life. On arrival at Godthaab in July, it is proposed to coast northward to Jacobshavn, and there to winter, proceeding in dog-sledges at the beginning of the New Year to Upernivik and the Eskimo settlements at Cape York and on the shores of Smith sound. The expedition will probably occupy from eighteen months to two years.

The German Antarctic Expedition.—A letter from Dr. Enzensperger, one of the scientific observers on Kerguelen island in connection with the German Antarctic Expedition, is printed in the March number of *Petermanns Mitteilungen* and in the *Zeitschrift* of the Berlin Geographical Society. It is dated December 20 last, and gives an account of the voyage of the *Tanglin* from Sydney, and the landing of stores, etc., both for the *Gauss* and for the Kerguelen station, with the buildings for which considerable progress had been made at the time of writing, in spite of difficulties occasioned by stormy weather. Down to the departure of the *Tanglin* the *Gauss* had not arrived at Kerguelen, the telegram received from Australia early

in the present year referring only to the safety of the Kerguelen party; but news has now been received in Berlin that the ship reached the island on January 2, with all well on board, and left again for Termination island on the 31st. The late arrival of the *Gauss* is said to have interfered somewhat with the observations at Kerguelen, as she had on board some of the required instruments. The publication of the scientific results of the voyage, as contained in the reports sent home by Dr. von Drygalski and his staff, has already been commenced in Berlin.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Oscillation of the Terrestrial Pole.—It is well known that the axis of the Earth describes a circle, with a radius of about 23½° round the pole of the ecliptic in a period of about 26,000 years. This movement, called precession, was known to Hipparchus. Nutation was only discovered by Bradley in 1747. It is a kind of wobbling motion, similar to that produced in a spinning-top by a small piece of wax or other substance placed on the surface. Neither of these movements affects the geographical co-ordinates. There is, however, another variation that has been much discussed of late, by which the position of the axis of rotation relatively to the Earth's surface is changed, and the latest information about this movement is discussed by Dr. M. C. Engell, in the *Geografisk Tidskrift*, Bd. 16, Hefte 3 and 4. To illustrate its effects, Dr. Engell supposes the pole to be moved to Cape Cheliuskin. The latitudes on the meridian, through Cape Cheliuskin, will be diminished from the cape towards the present equator, and increased on the other side of the cape. On other meridians the differences will be less, and will vanish at the intersections of the old and new equators. The longitudes also will be changed—Spitsbergen, for instance, now in east longitude, will then be in west longitude. Bessel was the first to fully grasp the fact that the position of the axis with regard to the Earth's surface is not constant. In 1820–21 he estimated that the variation could not exceed 0·25″. Afterwards several observations were made with a view to solving the problem, and ten years ago many of the chief observatories of Europe and America co-operated in the work, with the result that the variation of the altitude of the pole was thoroughly demonstrated, and the maximum was recorded at Strasbourg and the minimum at Honolulu. Owing to different stars being chosen for observation, to the use of different instruments, etc., the results obtained could not be satisfactorily compared, and therefore it was resolved to establish a special department for the observation of the altitude of the pole. A mathematical analysis by Th. Albrecht showed that stations at an interval of 120° or 90° of longitude would be best adapted for the work, and finally the stations Mitsusava (Rikuku province, Japan), Ukiah (California), Gaithersburg (Maryland, 6 miles from Washington), and Carloforte (San Pietro island, Sardinia) were selected. The Russian station at Charjui, Central Asia, and the Cincinnati Observatory also took a share in the work. In December, 1899, all these stations were in full swing. An alt-azimuth instrument was used in order to determine the longitudes by Horrebow's method, and the records were sent to Potsdam, where all the material was worked up. Albrecht has calculated the variation, and given a graphic representation of it, which shows how very irregular the movement is. The maximum amounts only to about 0″·60, or about 65 feet on the Earth's surface, calculated from Bessel's spheroid. Stations are also to be established in Grahamstown, Gosford (30 miles from Sydney), and in Santiago, Chile, for observations in the southern hemisphere. Hardly anything is known of the causes of the phenomenon. It may be assumed that it is due to displacements of matter in the lithosphere, hydrosphere, or atmosphere, or in all three simultaneously. Seismographs indicate the existence of

movements in the Earth's crust, but these are scarcely sufficient to produce a perceptible movement of the globes. In the hydrosphere such displacements are on a larger scale, and Lamp has proved that a displacement of 2500 cub. miles (88,290 cub. feet) of water in the ocean, from 30° S. to 35° N. lat., will suffice to produce a difference of 0″·5 in the altitude of the pole at Berlin. Lamp believes that such a transference of water is actually brought about by means of ocean currents, and it certainly is probable that the summer heat may heap up the water in the northern hemisphere. Bakhuyzen holds that a connection can be proved between the sea-level in Holland and the polar variation. It has also been suggested that the unequal distribution of atmospheric pressure may produce movements. In that case the maximum displacement of the pole of inertia would be in the direction of the greatest alteration in the pressure, but such is not the case, and, therefore, atmospheric pressure is not the only cause.

GENERAL.

The Second Voyage of Vasco da Gama.—Two letters written by a certain Matteo da Bergamo, who accompanied the fleet of Vasco da Gama to India in the years 1502–1503, have been discovered in the library of St. Mark, and copies are published by Signor Prospero Peragallo in the bulletin of the Italian Geogr. Society, February, 1902. These letters were despatched from Mozambique on April 18, 1503, to Count Affaitati, for whom Matteo was agent, and Lopes states that on that date two vessels of the squadron sailed from Lisbon. Matteo reports that after leaving Melinde they came to a country called Abul, where a quantity of gum and a few diamonds were obtained, but otherwise his narrative is interesting only as confirming the accuracy of Lopes' account published in Ramusio's voyages.

The Oxford School of Geography.—The Report for the year 1901 states that the attendance of students during the Hilary, Easter, and Michaelmas terms was, respectively, 119, 36, and 93, the Easter term thus again showing a falling off as compared with the other two, but not to nearly the same extent as in 1900, when the number fell to 16. The number of students specializing in geography and availing themselves of laboratory instruction, besides attending most of the lectures, was, for the three terms respectively, 7, 4, and 6, as against 6, 4, and 5 in the previous year. The practical and tutorial instruction, from which especially valuable results are to be expected, has been, as in the former year, carried on regularly by Messrs. Herbertson and Dickson, the latter being assisted in the surveying class by Mr. Darbishire. The courses of lectures were as usual very comprehensive, dealing with various aspects of historical, economic, and physical geography. Much improvement has been effected in the equipment of the school, the sum of £210 having been expended on the most urgently needed additions to the plant, while the three rooms in the Old Ashmolean Building placed at the disposal of the school, have proved well adapted for the purpose. Presentations of 109 books, atlases, and pamphlets, and 209 sheets of maps have been made. A useful feature in the programme for 1902 is a vacation course, to extend from July 29 to August 19. It is intended primarily for teachers, and will be devoted to generalizations concerning the Earth as a whole, including a study of the figure and surface-forms of the Earth, the great trade-routes, the history of exploration, surveying, and map-making. An excursion to places of special geographical interest will be arranged at the conclusion of the course. The fee for the whole course is £2 2s., and names of intending students are to be sent as soon as possible to the Curator, School of Geography, Old Ashmolean Building.

OBITUARY.

Cecil Rhodes.

THE position occupied by the late Mr. Cecil Rhodes during the past twenty years has been of so commanding a nature that there is probably no single department of South African affairs which has not felt the influence of his great personality to a greater or less degree during that period. This is certainly the case with the course of geographical progress since the deceased statesman first came to the front as a moving power in the destinies of British South Africa. Mr. Rhodes' vast schemes for the extension of British influence towards the heart of the continent have had so many points of relation with geographical facts and considerations that the important share which he undoubtedly took in the furtherance of geographical work is not to be wondered at. Although, when the British South Africa Company was founded in 1888, the period of pioneer exploration in South Africa, associated with such names as Livingstone, Moffat, Baines, Mauch, Selous, and others, was well-nigh over, a vast amount has since been done towards the detailed mapping of the southern interior, and of this the greater portion has had more or less connection with the extension of the political sway of the company, and it is to Mr. Rhodes, as the moving spirit of that body, that the credit for the work achieved must be largely assigned. Fourteen years ago large areas even to the south of the Zambezi were still most imperfectly known, and the pioneer workers for the company, whilst opening up, like Mr. Selous, routes for the advance of civilizing agencies into the heart of Mashonaland and Matabeleland, were at the same time supplying the first basis for an adequate map of those regions. Work of the same character has more recently been done for the remote regions north of the Zambezi, and it is to officials of the company, whose work in this direction always had the cordial support of Mr. Rhodes and his fellow-directors, that the extension of the bounds of knowledge has been chiefly due; while by the encouragement given to the great undertaking of the geodetic survey of South Africa, Mr. Rhodes and his associates have done their part to extend to the countries under their rule the benefits of more scientific survey.

It would be out of place here to attempt to recall even the leading events of Mr. Rhodes' active career, which has been fully dealt with in the public press of the country. Born at Bishop Stortford in 1853, he carried through the great achievements with which his name will ever be associated within the comparatively short lifetime of forty-nine years, during the last thirty-two of which he had been intimately connected with South Africa.

Sir Richard Temple.

By the death of the Right Honourable Sir Richard Temple, Bart., G.C.S.I., C.I.E., the Society loses one of the most distinguished of its Fellows. Sir Richard had been in failing health for some time before his death, which occurred on March 15, exactly a week after his seventy-sixth birthday. Born March 8, 1826, a descendant through his great-grandmother of the Temples of Stowe, Richard Temple was educated at Rugby and Haileybury, and entered the Bengal Civil Service in 1846. After serving under Thomason in the North-West Provinces, he became, in 1854, private secretary to John (afterwards Lord) Lawrence, then Chief Commissioner of Lahore. Illness enforced his absence from India during the Mutiny, but he was able to return to his duties towards the end of 1857. After serving in the Finance

Office under Mr. James Wilson and Mr. Samuel Laing, he filled in quick succession the important posts of Chief Commissioner of the Central Provinces, Resident at Hyderabad, Foreign Minister (1868), Chancellor of the Indian Exchequer (1868), Lieut.-Governor of Bengal (1874), and Governor-General of Bombay. In all these offices Sir Richard displayed the greatest energy and ability, and continually made extensive journeys through the vast districts under his charge and in other parts of India. Especially was he active in alleviating the distress caused by the terrible famines of 1874 and 1877, and it was for his work in organizing relief that he received his baronetcy in 1876. In 1880 he returned home, and devoted himself to a parliamentary career. Prior to his election to the House of Commons in 1885, he published several books descriptive of India and life in India. He remained in parliament until 1895, and from 1885 till 1888 was also vice-chairman of the London School Board, and till 1892 chairman of the Finance Committee of that body. In 1896 he became a member of the Privy Council.

Sir Richard was elected a Fellow of the Royal Geographical Society in 1865. On his return from India in 1880 he was made a member of the Council, an office which he held until 1883. There were few parts of our Indian Empire with which he had not a personal acquaintance, and he took the greatest interest in the geography, not only of India, but of Central Asia generally, though his interest was chiefly centred in the important bearing which geographical conditions have upon political questions. To quote Sir Richard Temple's own words, what was to him important, was "that geography has its noblest function in describing the theatres of human action, and that he who would understand history aright must have a sound basis of geographical knowledge." In the years which immediately followed his return to this country, Sir Richard took a very active interest in the work of the Society. Not only did he frequently take part in the discussions which followed the reading of papers, but in 1880, 1881, and 1882 he himself delivered valuable addresses to the Fellows on "The Highway from the Indus to Candahar," "The Lake Region of Sikkim, on the Frontier of Tibet," and "The Geography of the Birthplace and Cradle of the Mahratta Empire." Sir Richard was a skilful artist, and his sketches added materially to the interest of his description of any country with which he happened to be dealing. In 1882 he was president of the geographical section of the British Association, and at the Southampton meeting in that year read an instructive paper on "The Central Plateau of Asia." As the claims made upon his time by his public engagements increased, Sir Richard was naturally unable to busy himself so actively in the work of the Society, but he travelled in Russia, Egypt, Turkey, Greece, Palestine, Spain, Norway, and America, and that he retained his interest in the Society to the end is evidenced by the fact that so late as May of last year he engaged in the discussion which followed Sir Thomas Holdich's paper on the "Geography of the North-West Frontier of India."

Sir Richard's eldest son, Lieut.-Colonel R. C. Temple, Chief Commissioner and Superintendent of the Andaman and Nicobar islands, who succeeds to the title, is a member of the Society of old standing, and a well-known writer on the Andaman and Nicobar islands.

Prof. Meiklejohn.

Prof. John M. D. Meiklejohn, whose death at the age of seventy-one occurred on April 5, was perhaps most widely known as the author of numerous text-books of history, geography, and literature, greatly in vogue among pupil teachers and other students. His geographical text-books were a great improvement on those

which they superseded, and, in some measure at least, helped to impart interest to and systematize on scientific lines, a subject of which the educational importance had too long been neglected. Prof. Meiklejohn was born at Edinburgh, and graduated at Edinburgh University. One of his first works was a translation of Kant's 'Critique of Pure Reason,' which met with a very favourable reception. After filling various posts in the educational world, he went through the Danish-German war in 1864, as a war-correspondent, and subsequently travelled in various countries on the Continent, including Russia. In 1874, having returned to Scotland and taken up educational work once more, he was appointed assistant-commissioner to the Endowed Schools Commission for Scotland. In 1876 a chair of education was established at St. Andrew's, and Mr. Meiklejohn was chosen to fill it. This professorship he held until his death. Prof. Meiklejohn was elected a Fellow of the Royal Geographical Society in 1886.

Dr. Ballay.

On January 25 the death took place, at St. Louis, Senegal, of M. Ballay, Governor-General of French West Africa. M. Ballay's career affords a striking illustration of the chances of distinction enjoyed by the African traveller, as distinct from all others, during the last quarter of the nineteenth century. He was, indeed, one of the most brilliant members of that not inconsiderable band of Europeans who, having made their first acquaintance with the Dark Continent in the character of pioneer explorers, became, as a result of the scramble for Africa, administrators of the vast areas which they had been instrumental in opening up to European influence. As a traveller, M. Ballay will always be associated with one better known in the geographical world, if less distinguished as an administrator—M. de Brazza. Born in 1846, M. Ballay was educated for the medical profession, and, indeed, qualified to practice as a doctor; but, becoming fired with the ambition to travel, he succeeded in getting appointed second in command of the expedition organized by M. de Brazza in 1875, and accompanied that explorer to the Ogowe river. He remained with de Brazza until the latter, after ascending the Ogowe nearly to its source and discovering the Alima river, returned to France early in 1879. In 1880 he again set out for the Ogowe, where M. de Brazza had preceded him, and after many delays succeeded in tracing the Alima to its junction with the Congo. In 1884 he was summoned to Europe to take part in the Berlin Conference, but the following year again saw him in the Congo basin, this time as one of the commissioners appointed to delimit the frontier between the French Congo and the Congo Free State. Subsequently he filled the posts of Lieut.-Governor of France's Gabun colony, and Governor of French Guinea (1890). This latter country especially he did a very great deal to open up to European influence. In 1900 he accepted the post of Governor-General of French West Africa, and proved unwearying in his efforts to stem the epidemic of yellow fever which has been raging in Senegal. His death, indeed, in his fifty-sixth year, must be attributed to his heroic efforts to prevent the spread of the disease.

Major Casati.

The death was reported from Como, early in March, of Major Gaetano Casati, who will be remembered as one of Emin Pasha's companions during the eventful years that the latter was shut up by the Mahdi in the Anglo-Egyptian Sudan. Casati was born at Lesmo in 1838. In 1859 he entered the corps of Bersaglieri

and took part in both the third and fourth wars of Italian independence against Austria. Subsequently he was appointed to the Topographical Department of the Leghorn Institute, and engaged in the work of constructing the Ordnance Survey maps of Italy. In 1879, when forty-one years of age, Casati resigned his commission in the army in order to be able to devote himself entirely to geographical work. An opportunity of acquiring practical experience as a pioneer explorer speedily presented itself to him. Gessi Pasha, who was then engaged in subduing Suleiman Pasha, wrote home to Italy from the Bahr-el-Ghazal asking that a young officer with some knowledge of cartography might be sent out to him to undertake the exploration of the Wella basin. Casati was selected for the post, and before the end of 1879 was on his way to the Equatorial Province. Shortly after, Gessi Pasha was summoned to Khartum, and Casati found himself left alone in the Bahr-el-Ghazal, practically thrown upon his own resources. The country was in a very unsettled condition, but in spite of the difficulties of the situation Casati continued the operations against the slave-traders as long as he could, and managed to make his way south to the Welle basin. Here he travelled widely, meeting, it may be mentioned, in the course of his wanderings, the famous German traveller Dr. Junker. In 1883, after many exciting experiences, Casati made his way to Lado, where Emin Pasha had taken up his position. Two years later, when Emin found it no longer possible to maintain himself at Lado in face of the Mahdi's troops, Casati accompanied his leader south to Wadelai, and opened up communications with Kabarega, King of Unyoro. At first Kabarega was friendly enough, but on the defeat of some of that monarch's warriors by the expedition sent out from this country under Mr. H. M. Stanley, Casati was made a prisoner, and barely escaped to Emin Pasha with his life. How he and his chief were finally found by Stanley and brought to Bagamoyo is a well-known story. If he made no very striking discoveries during his ten years' residence amongst the headwaters of the Nile, Casati at least collected a good deal of scientific information about the region, and supplemented usefully the work of Junker and Schweinfurth. On his return to Italy he published a somewhat disconnected account of his wanderings, an English translation of which has appeared under the title 'Ten Years in Equatoria.'

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1901-1902.

Ninth Ordinary Meeting, April 14, 1902.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Captain William Henry Beverley, West African Frontier Force; John Robert Brown, B.A.; Edward Alfred Collier, B.A.; Henry Herd Dennis; Henry Cubitt Gooch, B.A., LL.B.; J. P. Hornung; William Milroy; Lieut. G. C. Rodney Mundy, Resident of Ankole Province, Uganda; Almada Negreiros; Charles Parkinson Oates; Arthur Edmund Stearns; Algernon Turnor, C.B.; William Vincent; Charles J. Wallace, M.A., J.P.*

The Paper read was:—

"A Journey from Omdurman to Mombasa *viâ* Lake Rudolf." By Major H. H. Austin, C.M.G., D.S.O., R.E.

THE SOCIETY'S AWARDS.

The PRESIDENT said: I have to announce to the meeting that the Council has assigned the Royal Medal to Major Sykes for his work in Persia, and to General

Sir Frederick Lugard, whose great work in tropical Africa we are all well acquainted with. I may mention that the King now requires the names to be submitted to him for his approval before he orders the money to be given for the medals. The Council, with the approval of the Fellows of the Society, has resolved that there shall be a third Gold Medal in future, to be called the Victoria Medal, for geographical research, not necessarily to be given every year, but this year it has been assigned to Mr. E. G. Ravenstein. The Murchison Grant has been given to Mr. Stanley Gardiner, for his researches in Funafuti island, in the Pacific, and the Maldive islands, in the Indian ocean; the Gill Memorial to Mr. Chisholm, for his great services during many years' connection with geographical education; the Back Grant to Lieut. Amdrup, of the Danish navy, for his services along the coast of Eastern Greenland; and the Peek Award to Mr. Thomson, the founder of the Queensland branch of the Australian Geographical Society, who has done a great deal for geography in Australia.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Ann. G.* **10** (1901): 295-317, 401-428. **Lugeon.**

Recherches sur l'origine des vallées des Alpes occidentales. Par Maurice Lugeon. *With Illustrations.*

This has been noticed in the Monthly Record (*ante*, p. 210).

Alps—Glacial Epoch. **Penck.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 205-212.

Einige neuere Ergebnisse der Eiszeitforschung in den Alpen. Von Prof. Dr. Albrecht Penck.

Austria—Wienerwald. *G. Abh.* **8** (Heft I.) 1901): pp. 240. **Grund**

Die Veränderungen der Topographie im Wiener Walde und Wiener Becken. Von Dr. Alfred Grund.

This will be specially noticed.

Denmark. ———

Den Danske Turistforenings Aarsskrift, 1902. København: G. E. C. Gad, 1902. Size 9½ × 6, pp. 124 and xlviii. *Illustrations.*

Denmark—Oceanography. *La G., B.S.G. Paris* **5** (1902): 21–40. **Knudsen.**

L'Océanographie des détroits danois. Par Martin Knudsen. *With Map and Diagrams.*

France. *C. Rd.* **134** (1902): 491–493. **Bertrand.**

Sur la tectonique des environs de Biarritz, Bidart et Villefranque (Basses-Pyrénées). Note de M. Léon Bertrand.

France. **Friederichsen.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 232–247.

Die Vulkanlandschaften Central-Frankreichs und die Spuren ihrer ehemaligen Vergletscherung. Von Dr. Max Friederichsen.

France. *C. Rd.* **133** (1901): 897–900. **Termier.**

Nouvelles observations géologiques sur la chaîne de Belledonne. Note de M. Pierre Fermier.

France—Beaujolais. *Ann. G.* **10** (1901): 318–329, 429–437. **Privat-Deschanel.**

Le relief du Beaujolais. Par Paul Privat-Deschanel.

France—Canal. *Rev. G.* **50** (1902): 55–66. **Charpentier.**

Ce que doit être le canal des Deux-Mers. Par M. Charpentier.

While regarding the idea of a canal for large shipping as chimerical, the author thinks that one with a depth of about 13 feet, allowing a passage to vessels used in the coasting trade, would prove the great highway between north-west Europe and the Mediterranean.

France—Census. *Rev. Française* **27** (1902): 88–95. **Cilvanet.**

Le Recensement de 1901 en France. Par C. Cilvanet.

France—Geodesy. *C. Rd.* **133** (1901): 1179–1180. **Bigourdan.**

Sur la mesure de la méridienne de France, par Méchain, à la fin du xviii^e^ siècle. Note de M. G. Bigourdan.

Points out that corrections derived from unpublished observations of Méchain bring his results in many cases nearer those obtained with modern instruments by the Depôt de la Guerre than appears from the values given in the *Base du Système Métrique.*

France—Population. *La G., B.S.G. Paris* **5** (1902): 41–48. **Turquan.**

La population de la France d'après les résultats du recensement de 1901. Par V. Turquan. *With Maps.*

France—Somme. *A travers le Monde, Tour du Monde* **7** (1901): 409–412. ———

Falaises vives et Falaises mortes de la Somme. *With Map and Illustrations.*

France—Springs. *C. Rd.* **133** (1901): 1262–1264. **Martel.**

Sur de nouvelles constatations relatives à la contamination des résurgences (sources vauclusiennes) des terrains calcaires en France. Note de M. Martel.

Germany. **Baedeker.**

Southern Germany. Handbook for Travellers. By Karl Baedeker. Ninth Revised Edition. Leipsic: K. Baedeker; London: Dulau & Co. 1902. Size 6½ × 4½, pp. xxviii. and 296. *Maps and Plans. Presented by Messrs. Dulau & Co.*

This edition, which corresponds with the 27th German edition, has been enlarged by the addition of thirty pages of text and seven more maps and plans than were given seven years ago in the 8th edition.

Germany. *Z. Ges. Erdk. Berlin* **36** (1901): 219–229. **Frech.**

Ueber glaciale Druck- und Faltungserscheinungen im Oder-Gebiet. Von Prof. Dr. F. Frech. *With Plates.*

Germany—Erzgebirge. *C. Rd.* **134** (1902): 96–98. **Ballore.**

Les tremblements de terre de plissement dans l'Erzgebirge. Note de M. F. de Montessus de Ballore.

The author regards the slight seismic phenomena still observable in the region of the Erzgebirge as the last manifestations of the tectonic forces to which the range owed its origin.

Germany—Folk-lore. *Globus* **81** (1902): 63. **Krebs.**

Geologische und meteorologische Motive einiger an Thüringer Seen geknüpften Sagen. Von Wilhelm Krebs.

Germany—Glacial Epoch. **Götz.**
Verh. Dreizehnten Deutsch. Geographentages, Breslau (1901): 213–217.
Der Verlauf der diluvialen Eiszeit in Schwaben. Von Prof. Dr. Wilhelm Götz.

Germany—Lakes. *Globus* **81** (1902): 7–12. **Halbfass.**
Ueber einige Einsturzbecken im nord-westlichen Thüringen und in der Vorderrhön. Von Dr. W. Halbfass. *With Maps and Profiles.*
These small but remarkable lakes were examined by Dr. Halbfass last year, and soundings made.

Germany—Nomenclature. **Vigener.**
Bezeichnungun für Volk und Land der Deutschen vom 10. bis zum 13. Jahrhundert. Von Fritz Vigener. Heidelberg: Carl Winter, 1901. Size 9 × 6, pp. viii. and 272.
An extension of a prize essay written in 1899 for the Philosophical Faculty at Heidelberg. The author treats exhaustively of the various designations bestowed on Germany and the Germans in the European literature of the period mentioned.

Germany—Ports. **Reinhard.**
Die wichtigsten Deutschen Seehandelsstädte. Ein Beitrag zur Geographie deutscher Städte. Von Dr. Rudolf Reinhard. (Forschungen zur deutschen Landes- und Volkskunde herausgegeben von Dr. A. Kirchhoff. XIII. Bd. Heft 6.) Stuttgart: J. Engelhorn, 1901. Size 9½ × 6½. *Plans and Illustrations.*

Greece—Kimolos. *B.S.R. Belge G.* **25** (1901): 350–366. **Hauttecœur.**
L'Ile de Kimolos. Par Henry Hauttecœur. *With Map.*

Greece—Railways. *Deutsche Rundschau G.* **24** (1902): 193–204. **Struck.**
Zur Geschichte der Eisenbahnen Griechenlands. Eine statistische Uebersicht von Ad. Struck. *With Map.*

Holland. *La G., B.S.G. Paris* **5** (1902): 49–53. **Van Baren.**
Description géographique de la Hollande au sud du Lek et de la nouvelle Meuse, au moyen âge. Par J. Van Baren. *With Maps.*

Holland—Terminology. **Beekman.**
Tijds. K. Ned. Aard. Genoots, Amsterdam **19** (1902): 1–58.
Nomina Geographica Neerlandica uit een geographisch oogpunt beschouwd. Door A. A. Beekman. *With Maps.*
An exhaustive disquisition on the meaning and usage of the terms Koog and Kogge as applied to geographical features in Holland.

Italy—Earthquakes. *Petermanns M.* **47** (1901): 265–271 **Gerland.**
Die italienischen Erdbeben und die Erdbebenkarte Italiens. Von Prof. Dr. G. Gerland. *With Map.*

Italy—Seismology. *B.S.G. Italiana* **2** (1901): 882–893. **Baratta.**
A proposito dei "Mistpoeffers" italiani. Nota del socio Mario Baratta. *With Map.*
On detonation-phenomena, locally known as "Balza" or "Trabuzzo," observed in north-east Tuscany.

Italy—Sicily—Messina. *B.S.G. Italiana* **3** (1902): 8–39. **Ricchieri.**
Tre escursioni in provincia di Messina. Note staccate del socio Prof. G. Ricchieri.

Italy—Vesuvius. **Melander.**
Öfversigt Finska Vet.-S. Förhandlingar **43** (1900–1901): 148–160.
L'influence du Vésuve sur l'air des environs. Par G. Melander.

Mediterranean. *Petermanns M.* **47** (1901): 284–285. **Henkel.**
Die Grenze der Sichtbarkeit des Landes auf dem Meere. Von Dr. L. Henkel. *With Map.*
This is referred to in a note (*ante*, p. 502).

Montenegro—Glaciation. **Hassert.**
Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 218–231.
Gletscherspuren in Montenegro. Von Prof. Dr. Kurt Hassert. *With Map.*

Northern Europe—Coasts. *Fennia* **18** (1900–1901), No. 7: 1–13. **Bonsdorff.**
Om landhöjningen vid Rusterna af Östersjön och Kattegat. Af A. Bonsdorff.
On the evidences of elevation on the coasts of Sweden, Finland, etc.

Russia. *G.Z.* **8** (1902): 23–43. **Tschulok.**
Das Moskauer Industriegebiet und der Oberlauf der Wolga. Von S. Tschulok.

Russia—Black Sea coast. *Ciel et Terre* **22** (1902): 505–510. **Tronquoy.**
De la formation des lagunes dites "Limans" des environs d'Odessa. Par G. du Tronquoy. *With Map.*

Russia—Finland. *Fennia* **18** (1900–1901), No. 9: 1–22. **Frosterus.**
Hufvudtyper inom de sydfinska landskapsformerna och berggrundens betydelse för uppkomsten af dem. Af Benj. Frosterus.
On the types of surface in Southern Finland.

Russia—Finland. *Fennia* **18** (1900–1901), No. 5: 1–26. **Hammarström.**
Om strandbildningar och marina gränsen i södra österbotten och angränsande trakter. Af R. Hammarström.
On recent investigations of raised beaches and allied phenomena.

Russia—Finland. **Homén.**
Öfversigt Finska Vet.-S. Förhandlingar **43** (1900–1901): 333–350.
Om skogarnas inflytande på Finlands Klimat. Föredrag af Th. Homén.

United Kingdom—New Forest. *Blackwood's Mag.* **170** (1901): 658–667. **Gleig.**
A Village in the New Forest. By Charles Gleig.

United Kingdom—Scotland. *Scottish G. Mag.* **17** (1901): 644–651. **Newbigin.**
Sir John Murray's Scheme for the Investigation of the Natural History of the Forth Valley. By Marion Newbigin, D.Sc.

United Kingdom—Somerset. **Buckman.**
Excursion to Dundry Hill, Thursday, May 30. Director S. S. Buckman. Report by the Director. (Reprinted from the *Proceedings of the Geologists' Association*, vol. xvii. part iv., August, 1901, pp. 152–158.) *Diagrams. Presented by the Author.*

United Kingdom—Wales. **Edwards.**
Wales. By Owen M. Edwards. (Story of the Nations Series.) Second Impression. London: T. Fisher Unwin, 1902. Size 8 × 5, pp. xxiv. and 422. *Maps and Illustations. Presented by the Publisher.*
In the opening chapter the author shows clearly the way in which Welsh history has been influenced by the physical geography of the country, the four natural divisions corresponding roughly with the four political centres of the country now represented by the four dioceses.

United Kingdom—Wales. **Hudson.**
A Geography of Wales intended chiefly for use in Welsh Schools. By A. E. L. Hudson. London: Macmillan & Co., 1901. Size 7 × 5, pp. xii. and 164. *Maps and Illustrations. Price* 1*s.* 6*d. Presented by the Publishers.*
A distinct advance on the ordinary school text-books, the author having endeavoured throughout to keep in view the modern conception of geography as the study of the Earth considered as the abode of man.

ASIA.

Arabia. *J. of T. Victoria I.* **33** (1901): 311–333. **Zwemer.**
The Wahábis: their Origin, History, Tenets, and Influence. By Rev. S. M. Zwemer.

Asia. **Monnier.**
Marcel Monnier. Itinéraires a travers l'Asie levés au cours du voyage accompli durant les années 1895, 1896, 1897, 1898 sur l'initiative et pour le compte du journal *Le Temps*, publiés sous le patronage de la Société de Géographie avec le concours du Ministère de l'Instruction Publique et des Beaux-Arts. With Atlas. Paris: Plon-Nourrit et Cie., 1900. Size 8 × 5 (Atlas 15 × 11½), pp. 248. *Plan and Illustrations. Price* 21*s.*
The text reproduces the daily itinerary notes of the traveller, and the atlas gives the results of his compass surveys on the scales of 1 : 150,000 (China-Korea) and 1 : 750,000 (Mongolia, Central Asia, Persia).

Asia. *Monthly Rev.* **6** (1902): 17–33. **Younghusband.**
European Expansion in Asia. By Major F. E. Younghusband, C.I.E.

Asia. **Zichy, Jankó, and Horváth.**

Dritte Asiatische Forschungsreise des Grafen Eugen Zichy. Band i. Herkunft der Magyarischen Fischerei, von Dr. Johann Jankó. Mit einem Vorläufigen Berichte des Grafen Eugen Zichy. Budapest: Victor Hornyánszky; Leipzig: Karl W. Hiersemann. 1900. Size 12½ × 9½, pp. 634. *Illustrations. Price* 25*s.*
Ditto. Band ii. Zoologische Ergebnisse. Redigirt von Dr. G. Horváth. 1901. Pp. xlii. and 472. *Illustrations. Price* 25*s.*

The first two volumes of a monumental work on the scientific results of Count Zichy's last journey across Northern Asia, undertaken mainly for ethnological research.

Caspian Sea. *Mem. Hydrography* **23** (1901): 256–307. **Lebedintseff.**

Chemistry of the Caspian Sea. By A. Lebedintseff. [In Russian.] *With Chart and Diagrams.*

Central Asia. *Fennia* **18** (1900–1901), No. 4: 1–53. **Donner.**

Voyage en Turkestan et en Dzoungarie en 1898. Par Otto Donner. *With Map.*

China. **Cordier.**

Histoire des Relations de la Chine avec les puissances occidentales 1860–1900. II. L'Empereur Kouang-Siu. Première partie, 1875–1887. Par Henri Cordier. Paris: F. Alcan, 1902. Size 9 × 5½, pp. 650. *Price* 7*s.* 6*d.*

The first volume of this important work appeared last year.

China. **Madrolle.**

Cl. Madrolle. Les premiers voyages français à la Chine: la Compagnie de la Chine, 1698–1719. Paris: A. Challamel, 1901. Size 11 × 7½, pp. viii., lxxxii., and 288. *Maps. Price* 25 *fr. Presented by the Author.*

The circumstances attending the first commercial ventures of the French to the coasts of China are less generally known than those of other nations, and M. Madrolle has done good service in bringing them clearly together in this volume. The introduction sketches the events which led to the formation of the successive "China companies" from 1698 onwards, and the bulk of the volume reproduces accounts of the voyages of the *Amphitrite* and other ships, mostly from unpublished documents. While showing that the voyage of the *Amphitrite* (1698–1700) is the first French voyage of which definite information exists, the author allows it to be possible that this vessel had been preceded by others.

China. *Ann. Hydrographiques* **2** S. (1901): 36–39. **Pirot.**

Note sur la détermination, par transport du temps, de la longitude de Chin-Wan-Tao (golfe du Petchili). Remarque sur la longitude de Tchefou. Par M. le lieutenant Pirot.

China. *Rev. Française* **27** (1902): 83–88. **Servigny.**

La Navigation du Yang-Tsé. Par J. Servigny.

China. **Smith.**

China in Convulsion. By Arthur H. Smith. 2 vols. Edinburgh and London: Oliphant and Co., 1901. Size 9 × 6, pp. (vol. i.) xvi. and 364; (vol. ii.) 365–770. *Price* 21*s. Maps and Illustrations.*

The author of this work is well known for his former instructive studies of Chinese life and character. He now supplies a full and impartial narrative, from observation at first hand, of the troublous events of the past two years, together with a study of the forces which have operated to bring about the present condition of things, and a forecast of the future.

China—Hong Kong. **Lockhart.**

Hong Kong. Report on Operations in the New Territory during 1900. Colonial Reports, Miscellaneous, No. 18, 1901. Size 9½ × 6, pp. 28. *Price* 2*d.*

China—Kiau-chau. *Deutsch. Kolonialzeitung* **18** (1901): 470–472, 485. **Maercker.**

Die Entwicklung des Kiautschou-Gebietes. Von Maercker. 2. Tsingtau als Eingangspforte von Schantung. *With Map.*

China—Pechili. *Deutsche Rundschau G.* **24** (1902): 145–151. **Nishiwada.**

Kurzer Bericht über eine Reise nach Schehol in Nord-China auf dem Lan-hô. Von K. Nishiwada. *With Map.*

The map and accompanying sections show the geological formations along the route.

China—Yang-tse Kiang. *Ann. Hydrographiques* **2** S. (1901): 16–17. **Lefèvre.**

Extrait d'un rapport de M. le capitaine de frégate Lefèvre, commandant le croiseur le *Bugeaud*, relatif à la navigation de ce bâtiment sur le Yang-tse Kiang, pendant la crue du mois de juillet 1901.

China—Yang-tse Kiang. *Rev. Maritime* **152** (1902): 115–140. **Sauerwein.**

La vallée du Yang-tse-Kiang. Par Charles Sauerwein.

Dutch East Indies. **Van der Chijs.**

Dagh-Register gehouden int Casteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India Anno 1673. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen, met medewerking van de Nederlandsch-Indische Regeering en onder toezicht van J. A. Van der Chijs. Batavia: 'sHage: M. Nijhoff. 1901. Size 11 × 7½, pp. 378.

Eastern Asia. *Ann. Hydrographiques* **2** S. (1901): 117–197. **Froc.**

L'atmosphère en Extrême-Orient pendant les six mois froids; son état normal; ses perturbations. Avis aux navigateurs par le Père Aloys Froc, S.J. *With Diagrams.*

India—Dutch Factories. **Van der Kemp.**

Bijd. Taal-, Land- en Volkenk. Ned.-Indië **9** (1901): 285–511.

De Nederlandsche Factorijen in vóór-Indië in den aanvang der 19e eeuw. Door P. H. van der Kemp. *With Map.*

India—Early Map. *Scottish G. Mag.* **18** (1902): 84–87. **Cash.**

The First English Map of India. By C. G. Cash. *With Maps. Also separate copy, presented by the Author.*

On a copy of a hitherto unrecorded second edition of Baffin's Map of India.

India—Himalayas. *Alpine J.* **21** (1902): 33–35. **Freshfield.**

Mount Everest, or Jomokangkar. By D. W. Freshfield.

Mr. Freshfield's reply to Dr. Ruge's note in *Petermanns Mitteilungen* on the name of Mount Everest.

India—Historical. *B.S.G. Italiana* **3** (1902): 92–129. **Peragallo.**

Viaggio di Matteo da Bergamo in India sulla flotta di Vasco da Gama (1502–1503), due documenti inediti pubblicati per cura e studio del Prospero Peragallo.

India—Kashmir. *Alpine J.* **21** (1902): 31–33. **Neve.**

The Pir Punjal Range and Tatticooti, Kashmir. By Dr. Ernest F. Neve. *With Illustration.*

India—Mishmi Country. **Ward.**

Military Report on the Mishmi Country published by the Intelligence Branch, Quartermaster-General's Department. By Lieut. G. L. S. Ward. Simla, 1901. Size 10 × 6, pp. 26. *Map and Illustrations. Presented by the Assistant Quartermaster-General, Intelligence Branch, Simla.*

India—Rampur. *Mem. Geolog. Surv. India* **32** (1901): 89–124. **Reader.**

Report on the Rampur Coal-field. By G. F. Reader. *With Map and Sections.*

India—Wainád. **Hayden and Hatch.**

Mem. Geolog. Surv. India **33** (Pt. 2) (1901): 1–48.

The Gold-fields of Wainád. By H. H. Hayden and F. H. Hatch, PH.D. *With Maps and Plates.*

Indian Ocean—Maldive Islands. **Willis and Gardiner.**

The Botany of the Maldive Islands. By J. C. Willis and J. Stanley Gardiner. (Extracted from Part 2 of vol. i. of the Annals of the Royal Botanic Gardens, Peradeniya.) [1901.] Size 9½ × 6, pp. 120. *Map. Presented by J. Stanley Gardiner, Esq.*

Indian Ocean—Minikoi. **Willis.**

Note on the Flora of Minikoi. By J. C. Willis. (Extracted from Part 2 of vol. i. of the Annals of the Royal Botanic Gardens, Peradeniya.) [1901.] Size 9½ × 6, pp. 6. *Presented by J. Stanley Gardiner, Esq.*

Japan—Ainu. **Batchelor.**

The Ainu and their Folk-Lore By the Rev. John Batchelor. London: The Religious Tract Society, 1901. Size 9 × 5½, pp. xxvi. and 604. *Illustrations. Presented by the Publishers.*

The present work is intended to supersede the well-known work of the same author

published in 1892, but is far from being merely a revised edition, as it includes a large amount of new material, while embodying in a corrected form much that appeared in the former work. It is a valuable storehouse of facts for the ethnological student.

Japan—Trade. **Longford.**

Foreign Trade and Shipping of Japan, 1872–1900. Foreign Office, Miscellaneous, No. 564, 1901. Size 9½ × 6, pp. 10. *Price* 1*d.*

Korea. *T. Korea Br. R. Asiatic S.* **2** (1901): 1–36. **Trollope.**

Kang-wha. By Rev. M. N. Trollope.

A full account of the island of Kang-wha, lying off the west coast of Korea.

Malay Archipelago. **Haeckel.**

Aus Insulinde. Malayische Reisebriefe. Von Ernst Haeckel. Bonn: Emil Strauss, 1901. Size 10 × 6½, pp. xii. and 260. *Map and Illustrations. Price* 9*s.*

This will be specially noticed.

Malay Archipelago—Borneo. **Haddon.**

Head-Hunters, Black, White, and Brown. By Alfred C. Haddon. London: Methuen & Co., 1901. Size 9 × 6, pp. xxiv. and 426. *Maps and Illustrations. Price* 15*s. Presented by the Publishers.*

This will be specially reviewed.

Malay Archipelago—Java. *J. United Service I. India* **31** (1902): 1–17. **Burton.**

The Conquest of Java. By Captain R. G. Burton. *With Map and Plan.*

Malay Archipelago—Java. **Niermeyer.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **19** (1902): 171–174.

De uitbarsting van 1593: Raun of Ringgit? Door J. F. Niermeyer.

Russia—Siberia. *Questions Dipl. et Colon.* **12** (1901): 656–671. **Labbé.**

La Colonisation en Sibérie; la Steppe Kirghize. Par Paul Labbé. *With Map.*

Russian Central Asia. *Rev. Française* **26** (1901): 710–716. ——

Raccordement du Transcaspien. Par G.V. *With Map.*

On the projects set on foot for the purpose of connecting the Trans-Caspian railway with the Siberian lines.

Russian Turkestan. **Krafft.**

Hugues Krafft. À travers le Turkestan Russe. Paris: Hachette et Cie., 1902. Size 14 × 10, pp. viii. and 230. *Illustrations. Price* £3.

This magnificently illustrated work will be reviewed elsewhere in the *Journal*.

Turkey—Asia Minor. *Sitzb. A.W. Wien* **109** (Ab. 1) (1900): 498–525. **Schaffer.**

Geologische Studien im südöstlichen Kleinasien. Von Dr. Franz Schaffer.

Turkey—Palestine. **Conder.**

Quarterly Statement, Palestine Exploration Fund (1902): 97–105.

Zuallardo's Travels. By Colonel C. R. Conder.

Turkey—Palestine—Dead Sea. *Ciel et Terre* **22** (1901): 55–64. **Gautier.**

La mer Morte. Par L. Gautier.

AFRICA.

Abyssinia. **Le Roux.**

Hugues Le Roux. Ménélik et Nous. Le Carrefour d'Aden. La Route d'Addis-Ababâ. Je suis l'hôte du Négus. Vers le Nil Bleu. France et Abyssinie. Paris: Nilsson. [1901.] Size 9½ × 6½, pp. 446. *Maps and Illustrations. Price* 10 *fr. Presented by the Author.*

A brightly written popular account of M. de Roux's journey in Abyssinia, which has been more than once referred to in the *Journal*. In the first chapter the author expresses his opinions as to the political relations of Abyssinia, especially with France. He has a great admiration for the statesmanship of Menelik (whom he likens to Louis XIV.), and believes in the high commercial importance of the Jibuti-Harrar railway. There are two good maps, one showing the region from the coast to Addis Abbaba, the other, reproduced from *La Géographie* (cf. *ante*, p. 87), that of the Blue Nile.

Africa—Zoogeography. *Naturw. Wochenschrift* **1** (1901): 145–150. **Kolbe.**

Ueber die Entstehung der zoo-geographischen Regionen auf dem Kontinent Afrika. Von Prof. H. J. Kolbe.

Azores. **Mees.**

Histoire de la découverte des iles Açores et de l'origine de leur dénomination d'îles Flamandes. Par Jules Mees. (Université de Gand. Recueil de travaux publiés par la Faculté de Philosophie et Lettres. 27me fascicule.) Gand: Librairie, Vuylsteke, 1901. Size 10 × 6½, pp. 144. *Maps. Presented by the Author.*

British East Africa. **Watt.**

Vocabulary of the Kikamba Language. By Stuart Watt. Harrisburg, Pa.: Fred. Kelker, 1900. Size 5½ × 3, pp. 154. *Presented by the Author.*

The R.G.S. system of orthography is in the main followed, but a sensible innovation is the use of the sign ' to separate the *g* sound from that of the preceding *n* in such words as *kilin'gi*, and to combine the two into the nasal sound in others, like *king'ang'i*.

British Possessions. *Scottish G. Mag.* **18** (1902): 57–76. **Johnston.**

The Protectorates of Great Britain in Tropical Africa. By Sir Harry H. Johnston, G.C.M.G., K.C.B.

Cape Colony. **Black.**

The Fish River Bush, South Africa, and its Wild Animals. By W. T. Black. Edinburgh and London: Young J. Pentland, 1901. Size 9 × 6, pp. 56. *Illustrations. Presented by the Author.*

Reprinted from the *Edinburgh New Philosophical Journal* of July and October, 1853. The author was stationed in the Fish river district during the Caffre wars.

Cape Colony—Geology.

Cape of Good Hope. Department of Agriculture. Annual Report of the Geological Commission, 1898. (Pp. 98.) Ditto, 1899. Cape Town, 1900. Size 10 × 8, pp. 110.

Central Africa. *Church Miss. Intelligencer* **53** (1902): 181–192. **Crabtree and Buckley.**

On the Slopes of Mount Elgon. Letters from the Rev. and Mrs. W. A. Crabtree and the Rev. T. R. Buckley.

Central Africa. *La G., B.S.G. Paris* **4** (1901): 297–320; 419–448. **Dyé.**

Positions géographiques déterminées astronomiquement en Afrique Centrale au cours de la Mission Marchand. Par A. H. Dyé. *With Map.*

See note in the April number (p. 505).

Congo State—Katanga. *La G., B.S.G. Paris* **4** (1901): 321–338; 403–418. **Lemaire.**

Grottes et Troglodytes du Ka-Tanga. Par Capitaine Ch. Lemaire. *With Map and Illustrations.*

East Africa—Nyanja Language. **Hetherwick.**

A Practical Manual of the Nyanja Language. By the Rev. Alexander Hetherwick. London: Society for Promoting Christian Knowledge, 1901. Size 6½ × 4, pp. xviii. and 256. *Presented by the Author.*

A companion volume to the same author's 'Handbook of the Yao Language' (see below), on a similar plan, though less space is given to the vocabularies. It should be of much use as providing a simple guide to the principal language of the British Central Africa Protectorate.

East Africa—Yao Language. **Hetherwick.**

A Handbook of the Yao Language. By the Rev. Alexander Hetherwick. Second Edition. Revised and Enlarged. London: Society for Promoting Christian Knowledge, 1902. Size 6½ × 4, pp. xxii. and 420. *Presented by the Author.*

The additions to the work as it first appeared in 1889, consist chiefly in the enlargement of the Yao-English vocabulary, and the inclusion for the first time of an English-Yao vocabulary, based on one compiled by the Domasi mission press. Some extra illustrations of points in grammatical structure have also been added to Part i.

Egypt. **Beadnell.**

Découvertes géologiques récentes dans la vallée du Nil et le désert Libyen. Par M. Hugh J. L. Beadnell. (Extrait du Compte rendu du VIII^e^. Congrès géologique international, 1900.) Paris, 1901. Size 10 × 6½, pp. 28. *Map and Illustrations. Presented by the Author.*

This contains illustrations not given with the English translation already noticed in the *Journal*.

Egypt. **Willcocks.**

The Nile Reservoir Dam at Assuân and After. By W. Willcocks, C.M.G. London:

E. & F. N. Spon, 1901. Size 10½ × 7, pp. 30. *Plans and Illustration.* *Price* 6*s. net. Presented by the Publishers.*

A useful sketch of the history of the Nile reservoir scheme, the designs for which were drawn up by the author in 1895 when Director-General of Reservoirs in Egypt, with a forecast of the possibilities of future development of irrigation works throughout the Nile basin. The author considers that works undertaken in various parts of the Sudan would both bring prosperity to that region and at the same time save Egypt from the risks attending an unusually high flood, while ushering in an era of prosperity in that country surpassing the wildest estimates yet made.

Egyptian Sudan. **Gwynn.**

Surveys on the Proposed Sudan-Abyssinian Frontier. By Major C. W. Gwynn. (From the *Geographical Journal* for December, 1901.) Size 10 × 6½, pp. 12. *Map and Illustrations.*

Egyptian Sudan. **Witherby.**

Bird Hunting on the White Nile: A Naturalist's Experiences in the Sudan. By Harry F. Witherby. London: Office of *Knowledge*, 1902. Size 8 × 5½, pp. 118. *Illustrations. Presented by the Author.*

The author is evidently a careful observer, and gives interesting details respecting the bird-life on the White Nile above Omdurman, where he collected in 1900; such points as the migrations of certain species, and the protective colouring or attitudes of others, being frequently touched upon. The several chapters are reprints, with slight alterations, of a series of articles in *Knowledge*. An interesting fact noted is that objects of barter were useless throughout, money being always demanded as payment for goods.

Eritrea. *Riv. G. Italiana* **9** (1902): 52–64. **Rossini.**

Il censimento delle popolazioni indigene della Colonia Eritrea. Relazione di Carlo Conti Rossini.

French Somaliland. *Mouvement G.* **19** (1902): 79–83. ——

Le chemin de fer de Djibuti à Harar.

German East Africa. *Globus* **81** (1902): 53–57. **Kannengiesser.**

Verkehrsverhältnisse in Deutsch-Ostafrika. Von G. A. Kannengiesser.

German East Africa. **Kohlschütter.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 133–153.

Die kartographischen und geophysischen Arbeiten der Pendel-Expedition der Königlichen Gesellschaft der Wissenschaften zu Göttingen in Deutsch-Ost-Afrika. Von Dr. E. Kohlschütter. *Maps. Also separate copy presented by the Author.*

This is noticed in the Monthly Record (*ante*, p. 639).

German Protectorates. *J. African S.* **1** (1902): 184–191. **Zimmerman.**

Trade of the German Protectorates. By Dr. Alfred Zimmerman.

German South-West Africa. **Schenck.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 154–166.

Deutsch-Südwest-Afrika im Vergleich zum übrigen Süd-Afrika. Von Prof. Dr. Adolf Schenck.

The writer shows that as regards geology and physical geography, South-West Africa stands apart from the greater part of South Africa, and that great gold discoveries are not to be expected, though the case is different as regards diamonds and copper. The climate is analogous to that of the Karroo, and success may therefore be expected from attempts to develop stock-rearing industries, especially in the case of the merino sheep and Angora goat.

German South-West Africa. **[Volkmann.]**

Deutsch. Kolonialblatt **12** (1901): 866–868, 908–909, 912.

Reise von Grootfontein nach dem Okavango.

Italian Somaliland. **Pestalozza.**

Somalia Italiana. Il Sultanato dei Migiurtini. Rapporto del cav. G. Pestalozza. (B. Ministero Affari Esteri, Ottobre 1901.) Roma, 1901. Size 9 × 6, pp. 44. *Map.*

Kamerun. *M. Deutsch. Schutzgeb.* **14** (1901): 209–213. **Danckelman.**

Die Höhenmessungen von Dr. Esch in Kamerun. Bearbeitet von Dr. v. Danckelman.

Kamerun. *M. Deutsch. Schutzgeb.* **14** (1901): 214–222. **Moisel.**

Begleitworte zu der Karte "Die Flussgebiete des Mungo und Unteren Wuri." Von M. Moisel. *With Map.*

Kamerun. *M. Deutsch. Schutzgeb.* **14** (1901): 223. **Schnauder.**

Astronomische Ortsbestimmungen in Kamerun, angestellt von Dr. Esch. Berechnet von Prof. M. Schnauder.

Kamerun. **Stein.**

Deutsch. Kolonialblatt **12** (1901): 742–746; **13** (1902): 8–10, 42–45, 64–67.

Expedition des Freiherrn v. Stein.

See notes in the February and present numbers (pp. 218, 638).

Kamerun. **Spellenberg.**

Beiträge Kolonialpolitik **3** (1901–1902): 185–192, 211–216, 243–248.

Ein Beitrag zur Land- und Völkerkunde von Kamerun-Hinterland. Von G. Spellenberg.

Madagascar. **Grandidier.**

Histoire physique, naturelle et politique de Madagascar publiée par Alfred Grandidier. L'Origine des Malgaches, par Alfred Grandidier. Paris: Imprimerie Nationale, 1901. Size 13 × 10, pp. 180. *Presented by the Author.*

This is the first part of the ethnographical section of the great work on Madagascar, published under M. Grandidier's direction, which is to form when complete fifty-two volumes. The writer sums up with great clearness the conclusions as to the eastern origin of the Malagasy to which he was first led in 1872, and which have since been accepted by most anthropologists.

Madagascar. *Rev. Française* **27** (1902): 25–31. **Gallieni.**

Le développement de Madagascar. Par G^{al} Gallieni.

Madagascar. *Rev. Madagascar* **3** (1901): 930–935. **Hérault.**

Les Ressources minières de Madagascar. Par Philippe Hérault.

Madagascar. *Rev. Madagascar* **3** (1901): 761–767. **Huet.**

Histoire de l'occupation du territoire des Antaimorona par les Hova depuis 1842 jusqu' à l'arrivée des Français. Résumé des guerres entre Antaiony, Ampanabaka et Zanaseranana. Par C. Huet.

Madagascar. *Rev. Madagascar* **3** (1901): 844–855. **Sainjon.**

Le pays Antanosy. Par Lieutenant Sainjon. *With Map.*

Madagascar—Gold. *Rev. Française* **28** (1901): 522–527. **Servigny.**

L'or à Madagascar. Par J. Servigny.

Madeira. *B.S.G. Lisboa* **18** (1900): 5–13. **Martins.**

A Madeira e o seu clima. Pelo Dr. João Augusto Martins.

Morocco. **Doutté.**

Renseignements Colon., B. Comité l'Afrique Française **11** (1901): 161–178.

Une Mission d'études au Maroc. Le Voyage de M. Edmond Doutté. *With Map.*

See note, *ante*, p. 375.

Morocco. *Deutsche Rundschau G.* **24** (1901): 49–55. **Floericke.**

Marokko. Seine wirthschaftliche Bedeutung und seine politische Zukunft. Von Dr. Curt Floericke. *Map.*

Morocco. *Beitrage Kolonialpolitik* **3** (1901–1902): 176–182. **Jaap.**

Marokko. Von W. Jaap.

Morocco. *B.S.G. Com. Paris* **22** (1901): 400–405. **Roquevaire.**

Note sur le voyage au Maroc de Georges Forrêt. Par René de Flotte Roquevaire. *With Map.*

Nigeria—Hausa Language. **Miller.**

Hausa Notes. By Walter R. Miller. London: Henry Frowde, 1901. Size 7½ × 5, pp. 128. *Presented by the Publisher.*

As stated by General Lugard in the preface, this little work is likely to prove of great assistance to officials and others whose work lies among the Hausa peoples. The work is quite original, and elucidates many points of grammar left unnoticed by previous writers.

North-East Africa. **Keller.**

Die landwirtschaftlichen Zustände im afrikanischen Osthorn. Von Prof. Dr. C. Keller. (Festschrift der Geographisch-Ethnographischen Gesellschaft in Zürich, pp. 127–143.) Zurich: F. Lohbauer, 1901. Size 9 × 6½. *Illustrations.*

Portuguese West Africa. **Negrevios.**

Colonies Portugaises. Ile de San-Thomé. Par Almada Negreiros. Paris: A. Challamel, 1901. Size 10 × 6½, pp. 166. *Maps and Illustrations. Presented by the Author.*

A welcome summary of our knowledge of San Thomé.

Sierra Leone. *B. Comité l'Afrique Française* **11** (1901): 395–401. **Salesses.**

Le chemin de fer de Sierra-Leone. Par le capitaine E. Salesses. *With Map.*

Transvaal. *Ann. G.* **10** (1901): 450–453. **Gallois**

La Géologie du Transvaal d'après M. Molengraaff. *With Sections.*

Based on a memoir in the *Bulletin* of the Geological Society of France.

Uganda—Railway. **Molesworth.**

The Uganda Railway. By Sir Guildford Molesworth. (International Engineering Congress, Glasgow, 1901. Section I. Railways.) Size 10 × 6½, pp. 10. *Maps and Illustrations. Presented by the Author.*

A sketch of the inception and execution of the Uganda Railway project.

Uganda—Railway. ———

Africa. No. 8 (1901). Report by the Mombasa-Victoria (Uganda) Railway Committee on the Progress of the Works, 1900–1901. London: Eyre & Spottiswoode, 1901. Size 13 × 8½, pp. 12. *Map. Price* 8*d.*

West Africa. *Globus* **80** (1901): 384–386. **Hutter.**

Der westafrikanische Bantuneger, Seine Charakteristik und Behandlung. Von Hauptmann a. D. Hutter.

West Africa—Gold. *J. School G.* **5** (1901): 333–339. **Speak.**

The Gold-producing Region of West Africa. By S. J. Speak.

NORTH AMERICA.

America—Historical. **Fischer.**

Die Entdeckungen der Normannen in Amerika. Unter besonderer Berücksichtigung der kartographischen Darstellungen. Von Jos. Fischer, S.J. Freiburg im Breisgau: Herdersche Verlagshandlung, 1902. Size 9½ × 6, pp. xii. and 126. *Maps. Price* 2 80*m. Presented by the Publisher.*

This will be specially noticed.

Bermuda. **Cole.**

Bermuda and the *Challenger* Expedition. A Bibliography giving a Summary of the Scientific Results obtained by that Expedition at and near Bermuda in 1873. By Geo. Watson Cole. Boston: Printed for Private Distribution, 1901. Size 9½ × 6, pp. 16. *Presented by the Author.*

Canada. *T. and P. New Zealand I.* **33** (1900): 552–554. **Hector.**

Early Explorations and Colonisation of Western Canada. By Sir James Hector. [Abstract.]

Canada—Altitudes. **White.**

Geographical Survey of Canada. Altitudes in the Dominion of Canada, with a Relief Map of North America. By James White. Ottawa, 1901. Size 10 × 7, pp. x. and 266. *Map and Profiles. Presented by the Author.*

This is valuable as the first general compilation of altitudes in Canada, and is based on all available information, including railway and canal profiles, reports and maps of the Geological Survey, reports on irrigation surveys, etc., etc. The map shows contours at five stages from 100 to 10,000 feet.

CENTRAL AND SOUTH AMERICA.

Argentine Republic—La Plata. *An. S. Ci. Argentina* **52** (1901): 209–234. **Foster.**

Régimen del Rio de la Plata y su corrección. Por Alejandro Foster. *With Maps.*

This will be noticed in the Monthly Record.

Bolivia. *B.S.G. La Paz* **3** (1901): 394–432, 481–498. **Wendt.**

El Distrito minero de plata de Potosi, Bolivia. Por Arturo F. Wendt. (Traducción de Manuel V. Ballivián y Edmundo Sologuren.) *With Plate.*

Bolivia—Census. *B. Oficina Nac. Inmigración, etc.* **1** (1901): 667–861. ———

Censo Nacional de la Población de la República [1° de Setiembre de 1900]. Informes de la Comisión Nacional sobre los resultados generales y primeros resúmenes de cada Departmento.

Bolivia and Brazil. *B.S.G. La Paz* **3** (1901): 442–446. **Munoz.**

La cuestión de Límites con el Brasil. By Juan L. Muñoz. *With Map.*

Brazil. *Popular Sci. Monthly* **60** (1902): 387–412. **Branner.**

The Palm Trees of Brazil. By Prof. John C. Branner. *With Illustrations.*

Brazil. *B.S.G. La Paz* **3** (1901): 525–527. **Idiaquez.**

Linea geodésica Madera-Yavary. Por Eduardo Idiaquez.

Gives the exact measurement of the line as deduced from the observations of the recent boundary commission, combined with previous data.

Brazilian Guiana. **De la Blache.**

La Rivière Vincent Pinzon. Étude sur la cartographie de la Guyane. Par P. Vidal de la Blache. (Université de Paris. Bibliothèque de la Faculté des Lettres, xv.) Paris: F. Alcan, 1902. Size 10 × 6½, pp. 116. *Maps. Price 6 fr. Presented by the Author.*

This will be the subject of a note.

Central America. **Sapper.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 285–302.

Die geographische Forschung in Mittel-Amerika im 19. Jahrhundert. Von Dr. Karl Sapper.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Moore.**

The Constitution of the Commonwealth of Australia. By Mr. Harrison Moore. London: John Murray. 1902. Size 9 × 6, pp. xx. and 396. *Price 16s. net. Presented by the Publisher.*

The author, who is Dean of the Faculty of Law in the University of Melbourne, traces the history of Australian Federation, showing the forces which have tended to bring about its realization, and then discusses in detail the constitution of the Commonwealth, and compares it with those of other countries. He evidently writes with full knowledge of the subject.

Australia. **Thomson.**

The Climate and Artesian Waters of Australia. By J. P. Thomson. (From *Queensland Geographical Journal*, No. 3, New Series, vol. xvii. 1902.) Size 9½ × 6½, pp. 32. *Presented by the Author.*

Australia. ———

Commercial Australia in 1900. Area, Population, Production, Railways, Telegraphs, Transportation Routes, Foreign Commerce, and Commerce of the United States with Australasia. (From the Summary of Commerce and Finance for November, 1901.) Treasury Department, Bureau of Statistics. Size 11½ × 9½, pp. 1835–1904. *Presented by the Philadelphia Commercial Museums.*

Queensland. *Rev. of Reviews for Australasia* (1901): 161–186. **Traill.**

Queensland at the beginning of the Century. By W. H. Traill. *Illustrations.*

Samoa. **Deeken.**

Manuia Samoa! Samoanische Reiseskizzen und Beobachtungen. Von Richard Deeken. Oldenburg, etc., G. Stalling. (Not dated.) Size 7½ × 5, pp. viii. and 240. *Illustrations. Price 5s.*

Based on observations during a recent visit to Samoa, this little book is useful as giving an idea of the state of things in the islands after a year of German rule. The author thinks that the long-standing feuds are now in a fair way to be composed, and assigns the merit for this to the wisdom and tact of the governor, Dr. Solf. He describes the steps which have been taken to give the natives a share in the management of their own affairs, and gives a forecast of the future of Samoa, of the importance of which, as a centre of German trade in the Pacific, he has a high opinion.

Western Australia. *R.G.S. Australasia (Victoria)* **19** (1901): 10–16. **Le Souëf.**

Notes of a visit to Western Australia. By W. H. Dudley Le Souëf. *Illustrations.*

POLAR REGIONS.

Antarctic—Climate. **Supan.**
Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 45–53.
Das antarktische Klima. Von Prof. Dr. A. Supan.

Antarctic—Exploration. *Popular Sci. Monthly* **60** (1902): 209–217. **Gregory.**
Antarctic Exploration. By Prof. J. W. Gregory. *With Maps.*
A sketch of the history of ideas respecting an antarctic continent, and of the work to be done by the present expeditions.

Antarctic—Geology. **Philippi.**
Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 33–44.
Die geologischen Probleme der Antarktis. Von Dr. Emil Philippi.

Antarctic—German Expedition. *Z. Ges. Erdk. Berlin* **36** (1901): 165–218. **Baschin.**
Die Deutsche Südpolar-Expedition. Von Otto Baschin. *With Plates. Also separate copy, presented by the Author.*

Antarctic—German Expedition. *Z. Ges. Erdk. Berlin* (1902): 66–77. **Drygalski.**
Von der Deutschen Südpolar-Expedition. Allgemeiner Reisebericht von E. von Drygalski.

Antarctic—German Expedition. **Neumayer.**
Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 3–32.
Zweiter Thätigkeitsbericht der Deutschen Kommission für die Südpolar-Forschung. Vom i. Vorsitzenden der Kommission, Prof. Dr. G. von Neumayer.

Arctic. **Cook.**
The People of the Farthest North. By Frederick A. Cook, M.D. [From *Everybody's Magazine*, January, 1902, pp. 19–33.] Size 9¼ × 7. *Illustrations. Presented by the Author.*

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cartography. *Scottish G. Mag.* **18** (1902): 34–39. **Bartholomew.**
The Philosophy of Map-making, and the Evolution of a great German Atlas. By J. G. Bartholomew. *With Portraits.*

Longitude. *Nautical Mag.* **71** (1902): 116–118. **Goodwin.**
Longitude by Equal Altitudes. By H. B. Goodwin, M.A.

Longitude. *Nautical Mag.* **71** (1902): 11–15. **Hall.**
Longitude by Equal Altitudes near Noon at Sea. By William Hall.

Surveying Instruments. **Hammer.**
Der Hammer-Fennel'sche Tachymeter-Theodolit und die Tachymeterkippregel zur unmittelbaren Lattenablesung von Horizontaldistanz und Höhenunterschied. Beschreibung und Anleitung zum Gebrauch des Instruments. Erste Genauigkeitsversuche. Von Dr. E. Hammer. Stuttgart: Konrad Wittwer, 1901. Size 10½ × 8½, pp. 52. *Plates. Presented by the Publisher.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coasts. **Wheeler**
The Sea Coast. (1) Destruction. (2) Littoral Drift. (3) Protection. By W. H. Wheeler. London: Longmans & Co., 1902. Size 10 × 6, pp. xii. and 362. *Illustrations. Price 10s. 6d. net. Presented by the Publishers.*
This will be reviewed elsewhere in the *Journal*.

Geological History. *Sitzb. A.W. Wien* **109** (Ab. I.) (1900): 811–857. **Hoernes.**
Die vorpontische Erosion. Von R. Hoernes.

Geological Maps. *J. Geology* **9** (1901): 708–717. **Eckel.**
The Formation as the Basis for Geologic Mapping. By Edwin C. Eckel.

Geology. **Jukes-Browne.**
The Student's Handbook of Stratigraphical Geology. By A. J. Jukes-Brown. London: E. Stanford, 1902. Size 8 × 5¼, pp. xii. and 590. *Maps, Diagrams, and Illustrations. Price 12s. net. Presented by the Publishers.*
A valuable feature in this text-book is the attempt to reconstruct the geography of the successive periods represented by the geological formations, which are treated not

merely as isolated groups of strata, but in their relations to past and still existing surface features. The scope of the book is, however, almost entirely limited to the British isles, except in cases where some knowledge of continental geology is necessary to a proper understanding of the changes that took place in Britain.

Geology—Surface Soil. *Science* **15** (1902): 33–35. **Means.**

On the Reason for the Retention of Salts near the Surface of Soils. By T. H. Means.

Glacial Epoch. *Geolog. Mag.* **9** (1902): 59–62. **Coleman.**

The Relation of Changes of Level to Interglacial Periods. By Prof. A. P. Coleman.

Glacial Epoch. *Die Natur* **50** (1901): 601–603. **Roth.**

Einige Worte über die Eiszeit. Von Dr. E. Roth.

Glacial Epoch. *J. of T. Victoria I.* **33** (1901): 393–418. **Upham.**

The Divisions of the Ice Age. By Warren Upham.

Glacial Erosion. **Günther.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 188–204.

Der gegenwärtige Standpunkt der Lehre von der Glacial-Erosion. Von Prof. Dr. S. Günther.

Seismology. *Sitzb. A. W. Wien* **109** (Ab. I.) (1900): 700–767. **Knett.**

Mittheilungen der Erdbeben-Commission der Kaiserlichen Akademie der Wissenschaften in Wien. XX. Ueber die Beziehungen Zwischen Erdbeben und Detonationen, von J. Knett. Ditto, XXI. Bericht über das Detonations-phänomen im Duppauer Gebirge am 14. August, 1899, von J. Knett. *With Map and Diagram.*

Terrestrial Physics. **Spitaler.**

Die periodischen Luftmassenverschiebungen und ihr Einfluss auf die Lagenänderungen der Erdachse (Breitenschwankungen). Von Dr. Rudolf Spitaler. (Dr. A. Petermanns Mitteilungen. Ergänzungsheft, Nr. 137.) Gotha: Justus Perthes, 1901. Size 11 × 7½, pp. 52. *Map. Price* 4*m.*

Zoo-Geography. **Pratt.**

Mem. and P. Manchester Lit. and Philosoph. S. **45** (1900–1901): No. 14, pp. 21.

Some Notes on the Bipolar Theory of the Distribution of Marine Organisms. By Edith M. Pratt, M.SC.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Discovery. **Grosvenor.**

The Geographic Conquests of the Nineteenth Century. By Gilbert H. Grosvenor. (From the Smithsonian Report for 1900, pp. 417–430.) Washington: 1901. Size 9½ × 6½. *Maps.*

Ethnology—Stone Age. **Giglioli.**

Materiali per lo studio della "Età della Pietra" dai tempi preistorici all' epoca attuale. Origine e sviluppo della mia collezione. Per Enrico Hillyer Giglioli. Firenze, 1901. Size 10 × 7, pp. 248. *Illustrations. Presented by the Author.*

Historical. **Errera.**

Prof. Carlo Errera. L'epoca delle grandi scoperte geografiche. Milano: Ulrico Hoepli, 1902. Size 7½ × 5, pp. xvi. and 432. *Maps and Illustrations.*

A concise and instructive sketch, not only of the great discoveries of the fifteenth and sixteenth centuries, to which the title might suggest the book to be limited, but of the gradual extension of knowledge during the middle ages by which the way was prepared for those discoveries. There are various sketches of famous maps, such as those of Fra Mauro, Juan de la Cosa, Diego Ribeiro, etc.

Historical. *Petermanns M.* **47** (1901): 271–275. **Wieser.**

Die älteste Karte mit dem Namen "America" a. d. J. 1507 und die Carta Marina a. d. J. 1516 des Martin Waldseemüller. Von Prof. Dr. Fr. R. v. Wieser.

See article by Mr. Soulsby in the February *Journal.*

History of Discovery. **Cucalón.**

B.S.G. y Estadistica Rep. Mexicana **4** (1897–): 239–245.

Factores que más han contribuido á los descubrimientos geográficos. Por el señor General Inocencio Cucalón.

BIOGRAPHY.

Bory de St. Vincent. *B.S.R.G. d'Anvers* **25** (1901): 523–550. **Donnet.**

Deux lettres de Bory de Saint-Vincent. Par M. Fernand Donnet.

The letters were written in 1803, when St. Vincent was returning from his sojourn in various African islands.

D'Albertis. *Deutsche Rundschau G.* **24** (1902): 182–184. ——

L. M. D'Albertis. *With Portrait.*

Le Conte. *Sierra Club B.* **4** (1902): 1–11. **Soulé.**

Joseph Le Conte in the Sierra. By Frank Soulé. *With Portrait and Plate.*

Maunoir. *La G., B.S.G. Paris* **5** (1902): 1–4. ——

Charles Maunoir (1830–1901). *With Portrait.*

Murray. *Deutsche Rundschau G.* **24** (1901): 135–136. **Wolkenhauer.**

Sir John Murray. Von W. Wolkenhauer. *With Portrait.*

GENERAL.

Bibliography. **Baschin.**

Bibliotheca Geographica. Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. Band vii. Jahrgang, 1898. Berlin: W. H. Kühl, 1901. Size 9 × 6, pp. xvi. and 478.

This volume contains about 9900 entries.

Bibliography. **Hamy.**

Publications Scientifiques de M. le Dr. E.-T. Hamy. Paris: Imp. Nationale, 1901. Size 9½ × 6½, pp. 28.

British Empire. **Heiderich.**

Das Wachstum Englands. Wirtschaftsgeschichtliche Skizze von Dr. Jean Heinrich Heiderich. Cassel: Gust-Klaunig, 1901. Size 9 × 6, pp. 66.

A careful study of the growth of the British Empire, the modern development of trade rivalry between the great world-empires, and the movement towards a closer commercial union between the component parts of Greater Britain.

British Empire. ——

The British Empire Series. Vol. 5, General. London: Kegan Paul, Trench, Trübner & Co., 1902. Size 8½ × 5½, pp. xx. and 682. *Maps. Price* 6*s. Presented by the Publishers.*

Like other volumes of the series, this is the outcome of lectures delivered at the South Place Institute, Finsbury, between 1895 and 1898, by experts in the various subjects treated of. Other articles, however, appear to have been added, for a publishers' note speaks of the delay occasioned by the transmission of proofs to writers of articles in all parts of the world. This delay has been somewhat unfortunate, as the articles are in many cases necessarily somewhat behind the time, but, taken as a whole, the volume, which is the last of the series, contains much interesting and instructive matter on questions affecting the prosperity of the Empire.

Consular Reports—Index. ——

Index to Reports of His Majesty's Diplomatic and Consular Representatives Abroad on Trade and Subjects of General Interest (with Appendix). 1898–1899. London: Eyre & Spottiswoode, 1902. Size 9½ × 6, pp. 192. *Price* 9*d.*

Education. **Bludau.**

Verh. Dreizehnten Deutsch. Geographentages Breslau (1901): 124–130.

Was gehört aus der Projektionslehre auf die Schule? Von Prof. Dr. A. Bludau.

Education. *G. Teacher* **1** (1902): 61–67. **Geikie.**

The Use of Ordnance Maps in Teaching Geography. By Sir Archibald Geikie, F.R.S.

Malaria. *P.R.I.* **16** (1901): 295–313. **Ross.**

Malaria and Mosquitoes. By Major Ronald Ross.

Photography—Diary. ——

Wellcome's Photographic Exposure Record and Diary, 1902. London: Burroughs, Wellcome & Co. Size 5½ × 3½, pp. 84. *Illustrations. Presented by the Publishers.*

Messrs. Burroughs & Wellcome have issued a handy pocket-book and diary for the

use of photographers. Besides the ample space allowed for the record of exposures with the details necessary as a guide to proper development, it contains a useful series of instructions, with tables of data for the use of photographers in various parts of the world, the question of exposure under the most varying conditions being fully dealt with.

Place-names. *Riv. G. Italiana* 8 (1901): 633–636. **Ricchieri and Marinelli.**

Toponomastica e Topolessigrafia. G. Ricchieri e O. Marinelli.

Royal Asiatic Society. **Cust.**

Some Remarks on the Royal Asiatic Society of Great Britain and Ireland, 1901. I. Narrative of Constitution, and Proceedings since the year of our Jubilee, 1873, to the end of the century. II. Suggestions for the Future. By Robert Needham Cust, LL.D. Hertford, 1901. Size 8 × 5½, pp. 12.

Year-book. ——

Annuaire pour l'an 1902, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars. Size 6 × 4, pp. 656, 34, 92, 16, 8, and 38.

NEW MAPS.

By E. A. REEVES *Map Curator*, **R.G.S.**

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from March 1 to 31, 1902.

1 inch:—

With hills in brown or black: 2, 134 (engraved). 1*s. each.*
Printed in colours: 111, 122, 124, 125, 128, 137, 138, 139, 140, 141, 143, 144, 156, 167, 168, 178, 179. 1*s. each.*

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25-inch—County Maps:—

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(*E. Stanford, London Agent.*)

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 4 : Durham. J. Bartholomew & Co., Edinburgh, 1901. *Price 2s. Presented by the Publishers.*

ASIA.

Indian Government Surveys. **Surveyor-General of India.**

India, showing railways with stations, 1899, 32 miles to an inch. 1901. 6 sheets. —Indian Atlas, 4 miles to an inch. Sheets: 49 N.W., parts of districts Rohtak, Hissar, Karnál and Delhi, and of Native States Jind, Dujana, and Loharu (Punjab), 1898; 51 S.E., parts of Native States of Bundelkhand, Datia, Gwalior (C.I. Agency), etc., Jhalawar (Rájputána Agency), 1900; 86 S.E., part of district Bahraich (Oudh) and of Nepal, 1899.—Lower Provinces Revenue Survey, 1 mile to an inch. Sheets: 1A, district Purnea, additions to boundaries, 1897, 1901; 3, 8, district Purnea, with additions to boundaries and railways, 1897, 1900-1; 9, district Purnea, with additions to boundaries, 1897, 1901; 13 and 14 (2nd edit.), district Monghyr, with additions to boundaries, 1897, 1901; 15, district Purnea, with additions to boundaries and railways, 1897, 1901.—Bengal Survey, 1 mile to an inch. Sheet 164, district Cuttack, Season 1894-95, 1901.—Punjab Survey, 1 mile to an inch. Sheets: 81, 82, 83, districts of Ráwalpindi, Jhelum, and Shahpur, Seasons 1855-56 and 1856-57, 1901.—Burma Survey, 1 mile to an inch. Preliminary edition; sheets 147 and 194 (New Series), district Schwebo, Season 1892-3, 1901; 2nd edition, sheets 72 and 113, district Minbu, Seasons 1891-93 and 1896-98, 1901; 353 (new series), district Thâton, Seasons 1892-97, 1901. —Upper Burma Survey, 1 mile to an inch. Preliminary edition, sheet 385, Southern Shan States, Season 1897-98, 1900; 2nd edition, sheet 294, parts of districts Yamèthin and Meiktila, and of Southern Shan States, Seasons 1893-94 and 1898-99, 1901.—Central India and Rájputána Survey, 1 mile to an inch. Sheets: 144, part of Udaipur Native State (Rájputána Agency), Seasons 1877-78 and 1879, 1901; 168, parts of district Merwara and Native State of Udaipur (Rájputána Agency), Season 1871-72, 1900; 211, parts of Indore, Rutlam, Sailána, Jhábua (C.I. Agency), and of Kusalgarh (Rájputána Agency), Season 1879-80-81, 1900; 235, parts of Udaipur and Bundi (Rájputána Agency), Holkar (Indore), Gwalior (Sindhia) (C.I. Agency), Season 1870-71, 1901; 418, parts of Native States Bijáwar, Charkhari, Panna, and Tehri (C.I. Agency), Seasons 1855-56, 1860-62, and 1870-71, 1901; 466, parts of Native State of Rewah (C.I. Agency), Seasons 1865-66-67-68, 1900.—Hyderabad Survey, 1 mile to an inch. Sheet: 210, part of Khamamet Circar (Nizam's Dominions), Seasons 1827-28 and 1837-38, 1891.—Sind Survey, 1 mile to an inch. Sheets: 12, 31, district Karachi, Seasons 1896-97 and 1897-98, 1900.—N.W. Trans-Frontier Series, 8 miles to an inch. Sheet: 14 N.E. (Baluchistán), Seasons 1884-85 and 1898-99, 1900.—Index to the Standard Sheets of the Punjab, 52 miles to an inch. Additions to 1899, 1901. *Presented by H.M. Secretary of State for India, through the India Office.*

Philippine Islands. **Greely.**

Progress Map of Signal Corps Telegraph Lines and Cables in the Military Division of the Philippines. Prepared under the direction of Brigadier-General A. W. Greely, Chief Signal Officer U.S. Army. Scale 1 : 887,040 or 14 stat. miles to an inch. 2 sheets. *Supplement to the National Geographic Magazine*, January, 1902.

This is a roughly executed outline map of the Philippine islands, with no attempt at hill shading. However, the information it contains will be very useful. It shows military telegraph lines and cables, the eastern extension of the Australasia and China Telegraph Company's cable, commercial and military telegraph stations, telephone stations, open ports, coastwise ports, lighthouses, and post-offices. A table is also given of the military cables. There are three insets, the principal being a plan of the environs of Manila. The map is published as a supplement to the *National Geographic Magazine* for January, 1902.

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheets : 45-B, Salmia; 66-C, Roseires; (Provisional) 78-C, Akobo; (Provisional) 78-I., Musha; 78-P, Mt. Lubur; 79-I, Lower Omo. *Price* 1*s.* 6*d.* each. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Sheet 61, Nikki. *Price* 2*s.* London : Intelligence Division, War Office. *Presented by the Director-General of Mobilization and Military Intelligence.*

Africa. **Service Géographique de l'Armée, Paris.**

Carte d'Afrique. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. Sheets 15, Cap Elba. Service Géographique de l'Armée, Paris. *Price* 1 *fr. each sheet.*

This is a new edition. With the exception of the inset plan of the ruins of Thebes, there is little on the sheet but the vicinity of Cape Elba.

Angola. **'Revista Portugal em Africa.'**

Angola. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Supplement to the *Revista Portugal em Africa*. 8 sheets. *Price* 14*s.*

This map appeared in sheets as a supplement to the 'Revista Portugal em Africa' during last year. It is a rough production, but in some parts a good deal of information is given, although in others it is already considerably out of date. During the past year the reports of the expeditions of Captain Lemaire along the Congo-Zambezi watershed, and of the members of Major Gibbons's expedition in the region of the upper Zambezi and its tributaries, have been published. Much new information was gained from these expeditions, but this evidently was made public too late to be included in this map, which in these parts must not be considered at all up to date.

Transvaal. **The Chartographic Company.**

New Map of the Witwatersrand Goldfields, compiled by the Chartographic Company from the latest Official and Private Surveys and Reports. Scale 1210 yards to 1 inch. London: The Chartographic Company. Two sheets. *Presented by the Publishers.*

One of the many coloured plans that have appeared showing mining properties, with their names, reefs, railways, roads, farm-boundaries, and other information.

West Africa. **Wallach.**

A Map of the Gold Coast, with part of Ashanti and the Ivory Coast. By Henry Wallach, F.R.G.S. Scale 1 : 253,440 or 4 stat. miles to an inch. Second edition. London: E. Stanford, 1902. Six sheets. *Price* £1 6*s.* *Presented by the Author.*

This is the second edition of a large-scale map of the Gold Coast and adjacent territories which first appeared in 1900. Since that date considerable progress has been made with the survey of the colony, necessitating many additions and alterations, which appear to have been carefully made. There has hardly been time to make use of the map of Lake Busumchwi and neighbourhood, from a survey by Mr. Malcolm Fergusson, which appeared in the *Geographical Journal* for March last, but this will no doubt be done in another edition. In addition to fresh routes, rivers, villages, etc., some hill-work is now shown, and many altitudes are given in figures which do not appear on the earlier edition. There are also many useful and important notes descriptive of the character of the country. The map, which formerly extended to the west only as far as about 3° 10′ W. long., has now been carried on, by the addition of two half-sheets, to 3° 50′ W. long., and thus includes part of the French territory of the Ivory Coast. It is published in two forms, one showing physical features and political boundaries only, and the other with the gold-mining properties marked in red.

AUSTRALIA.

Western Australia. **Campbell & Becher.**

Topographical Map of Kalgoorlie, based on Tacheometric Surveys. By W. D. Campbell, A.M.I.C.E., F.G.S., and the late S. J. Becher, M.E. Scale 1 : 7920 or 8 inches to one mile. Geological Survey of Western Australia, 1901. Four sheets. *Presented by the Agent-General for Western Australia.*

A large-scale mining map, showing claims with names. Contour-lines in brown, at 10-feet intervals, are laid down. Later on an edition is to be published with geological colouring, but the present one is in outline only.

GENERAL.

World. **Bartholomew.**

The International Student's Atlas of Modern Geography. A series of 105 Physical, Political, and Statistical Maps, compiled from British and Foreign Surveys, and the latest results of international research, under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S., etc. London: George Newnes, Limited. *Price* 6*s.* *Presented by the Publishers.*

The great advance that is being made in educational geography is evidenced by this school atlas, which has been published under the superinten lence of Mr. J. G.

Bartholomew, and which, for its price, six shillings, is a remarkably cheap production. It is clear that there has been a good deal of careful consideration in its preparation, and the arrangement of the maps appears to have been governed by a definite principle. In this respect the atlas contrasts most favourably with many cheap school atlases, which contain nothing more than a collection of roughly executed and most confusing political maps, either reduced by photography from those on a much larger scale, with the result that the names are too small to be legible, or selected from those that happened to be already in the publisher's stock, without any regard to their educational suitability. Importance has been given to physical geography, and before the maps of each continent or country, there are in many instances maps showing the geology, relief, rainfall, vegetation, etc. In addition to the larger-scale general maps of the world, there are fourteen smaller half-page maps, showing isothermal lines, winds, rainfall, tides, races of mankind, prevailing religions, density of population, equidistant costal lines, and a time-chart of the world, showing the times at places in different longitudes corresponding to mid-day at Greenwich. With the exception of one or two of these, which are on Mercator's projection, these are on Gall's cylindrical projection, which is hardly the best for educational purposes, as it does not preserve the true configuration of the land, nor give a correct idea of relative areas. The British Isles are very fully represented by the following maps: a bathy-orographical map of the British Isles, which includes also the whole of the North sea and adjacent coast of the continent of Europe; vegetation and geological maps; four small maps showing rainfall, and tidal flow, river-basins, January and July isotherms, railways, and population. After these come general political maps of England, Scotland, and Ireland, each of which is accompanied by larger-scale maps showing relief by contour-lines and colour-tinting. Throughout the atlas, the vegetation maps are worthy of special attention, and give a very good idea of the characteristic vegetation of any particular region.

There are one or two points that ought perhaps to have received greater attention, such as the scales of the maps and the proportion that the maps of one country bear to each other. It would have been better, too, if the natural scale of each map had been given, which, as far as possible, should have been certain multiples of 1 : 1,000,000. Plate 1, giving examples of a few principal projections, will doubtless be instructive so far as it goes, but this subject might with advantage have been treated more fully. In another edition it might be well to have a sheet showing different methods of representing topographical features, with special remarks on contour-lines, vertical sections, scales of maps, etc. As might have been expected from Mr. Bartholomew, the maps are well executed; on the whole great judgment has been shown in the selection of colours, and the printing is good. The atlas also contains an alphabetical list of countries indicating the maps in the atlas on which they are shown, a list of geographical terms, another of the principal explorers of the world, and a useful index. As the maps are printed on both sides of the sheets, the atlas is not bulky, notwithstanding the great amount of information it contains. Some of the maps have already appeared in other atlases, but these have been revised, and, on the whole, Mr. Bartholomew may be congratulated for having produced a remarkably good and cheap educational atlas.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich IV. Lieferung. Gotha: Justus Perthes. *Price* 60 *pf.*

The two maps in this part are new. One half of sheet No. 81 is occupied by a map of New Zealand, and the other by insets of New Guinea, Tasmania, Tahiti, Fiji islands, and other island groups of the Pacific ocean. The maps of New Zealand and Tasmania are on the scale of 1 : 5,000,000, and are both too small to be of much value. No. 93 is a useful little general map of the West Indies, on the scale of 1 : 7,500,000, with insets on enlarged scales of Jamaica, Porto Rico, Guadeloupe and Dominica, Martinique and Santa Lucia, St. Thomas, and the environs of Havana.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, January and February, 1902. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3164 m	= 6·75	England, west coast: Morecambe bay:—Barrow harbour. 2*s.* 6*d.*
109 m	= {1·48 / 2·9}	England, east coast:—Entrance to the river Humber. (Plans:—Kingston-upon-Hull, Grimsby road.) 2*s.* 6*d.*

3165 m = 6·8 Ireland, west coast :—Bantry and Glengariff harbours. 2*s.* 6*d.*
3217 m = 6·75 North America. Newfoundland, east coast :—Pilley island harbour. 1*s.* 6*d.*
3167 m = 3·9 Cuba, north coast :—Puerto Padre. 2*s.* 6*d.*
1324 m = 0·07 South America, east coast :—Buenos Aires to Cape Dos Bahias. 2*s.* 6*d.*
3162 m = 2·0 British Columbia :—Discovery passage. 2*s.* 6*d.*
3178 m = {6·3 / 6·0 / 4·0} British Columbia : Plans in Discovery passage :—Gowlland harbour, Otter cove, Elk and Duncan bays. 1*s.* 6*d.*
3251 m = 7·3 Aleutian islands :—Dutch and Iliuliuk harbours. 1*s.* 6*d.*
3180 m = 0·4 Gulf of Aden and Red sea :—Straits of Bab-el-Mandeb and approaches. 2*s.* 6*d.*
3254 m = 3·25 Australia, north coast :—Norman river entrance. 1*s.* 6*d.*
3179 m = 4·9 Australia, south coast :—Plans on the south coast of Australia : Starvation boat harbour. 1*s.* 6*d.*
3189 m = 0·5 Australia, south coast :—Cape Le Grande to Cape Pasley. 2*s.* 6*d.*
1719 Italy, west coast. New plans :—Giannutri isle, Gergona island, Pianosa island.
911 Plans of anchorages between Borneo and New Guinea. Plans added :—Wei Pelau and Awa anchorages.
979 Pacific islands :—Between 160° E. and 150° W. long. New plan :—Pleasant island. Plan added :—Ocean island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
421 Plan of Pilley island, harbour, and approaches on this sheet.	New plan. Pilley island harbour	3217
418 Plan of Port Padre on this sheet.	New plan. Puerto Padre	3167
1324 Rio de la Plata to Rio Negro. 1288 Rio Negro to Cape Three Points.	New chart. Buenos Aires to Cape Dos Bahias	1324
580 Plan of Otter cove on 2870 these sheets. 2067 Plans of Gowlland harbour, Duncan bay and Quathiaski cove on this sheet.	New plans. Otter cove, Gowlland harbour, and Duncan bay on this sheet	3178
1457 Plan of Iliuliuk harbour on this sheet.	New plan. Dutch and Iliuliuk harbours	3251
1807 Norman river entrance. Plan on this chart.	New plan. Norman river entrance	3254

Charts that have received Important Corrections.

No. 1188, The World :—Coal and telegraph chart. 2253, England, south coast :—Dartmouth harbour. 2682, Bristol channel :—Nash point to New passage. 122, Netherlands :—Mouths of the Maas. 2322, Netherlands :—Zuyder Zee. 1971, Norway approaches to Trondjem. 863, Labrador :—Hudson bay and straits. 2806, United States, east coast :—Charlestown harbour. 472, Haiti or San Domingo :—Harbours and anchorages on the coast of. 2259, Colombia :—Savanilla harbour. 1319, Chile :—Conception bay. 22, Persian gulf :—Kuweit harbour. 2757, Banka strait to Singapore. 942B, Eastern archipelago :—Eastern portion. 1602, China, north-east coast :—Approaches to the Yang-tse Kiang. 1601, China, north-east coast :—Wusung river. 857, China, north coast :—Kian chau bay. 358, Japan :—West coast of Kiusiu and Nipon. 1055, Australia, west coast :—Bedout island to Cape Cuvier. 2731, Australia, south coast :—Geelong harbour. 1670A, Australia, east coast :—Moreton bay, sheet 1. 2766, New Guinea, north-east coast. 979, Pacific islands between 166° E. and 150° W. long. :—Plan of Mauahiki on this sheet.

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for March and April, 1902. London : Meteorological Office. *Price* 6*d.* *Presented by the Meteorological Office, London.*

Russian Charts. **Chief Hydrographic Department, Ministry of Marine, St. Petersburg.**

Arctic Ocean.

No.
576 Chart of Yugorski strait. Scale 1·15 stat. mile to an inch. 1901.

Black Sea.

559 Plan of Novorossisk harbour and port. Scale 420 feet to an inch. 1901.

North Pacific Ocean.

568 Plan of Bereviuskaia bay, Kamchatka. Scale 2030 feet to an inch. 1901.
Presented by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for April, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China. **Parsons.**

Eighteen Photographs of China from Hankau to Canton. [By W. Barclay Parsons, Esq., 1901. *Presented by W. Barclay Parsons, Esq.*

Taken by Mr. Barclay Parsons, an American engineer, during his recent survey for a proposed railway between Hankau and Canton—

(1) Coolies carrying coal from mines to river; (2) Ricefields and farm building in the Lu valley; (3) Rafts on the Tung-ting lake; (4) Pottery works; (5) Water-gate at Hankau, at the junction of the Han and Yang-tse rivers; (6) Farm buildings in Eastern Hunan; (7) Gateway and street in Hu; (8) Li-ling cantilever bridge; (9) Hunan farm of the better class; (10) Kwangtung village and pawnshop; (11) Bridge below Chiling Pu; (12) Sandstone cliffs west of Wa Yao Ping; (13) Che-ling highway; (14) Yu-tan river, Nan-ling mountains in distance; (15) Mr. Barclay Parsons and party; (16) Siang river at entrance to Tung-ting lake; (17) Low-water channel of the Siang river through Tung-ting lake, showing alluvial deposit; (18) Rafts on the Tung-ting lake.

Peru.

Seventeen Photographs of the Inambari river and neighbourhood, 1901. *Presented by the Ministerio de Fomento, Lima, Peru.*

The Inambari is a tributary of the Madre de Dios in the department of Puno, Peru. The course of the river and the region through which it flows are but very imperfectly known; hence these photographs have a special interest. The following is a list of the titles:—

(1) View of the Inambari; (2) View of the Inambari below its junction where it receives the Chaspa; (3) Confluence of the San Gaban and the Inambari; (4) Crossing the San Gaban by means of an improvised bridge; (5) Natives spearing fish; (6) Members of the expedition before starting for the mountains; (7) Quepiris on the way to the mountains; (8) Quepiris preparing to depart for Llinquipata; (9) Arrival of porters (Quepiris) at Llinquipata; (10) View in the highlands of Macusani; (11) Llamas leaving Ayapata with baggage of the expedition; (12) Engineer F. Carbagal with the chief of a savage tribe; (13) Engineer F. Carbagal and others embarking on board a canoe at Mercedes; (14) Puerto Maria Mercedes; (15) View near the confluence of the Araza; (16) Embarking on board the canoe *Josefina Rosalva* on the Araza; (17) View of the flat country on the right of the Jaguar Mayo.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The following Lati
Tho. Lewis, the Lor
position of S. Salvac
of observations by R
S. Salvador -
Kialundwa -
Ntanda (Mbanza) -
Bangu - - -
Kizulu (Arthington)
Mpeveleka -
Koma - -
Makela (Mbongi) -
Tadi - - -
Kibokolo (Comber
Kimfuti - -
Kibulungu - -
Kintim
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2000
Kimwanda
6°
S.Salvador
1840
Kimpesi
Kisengi
Viunda
Zamba
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Kinalu
Nkoko
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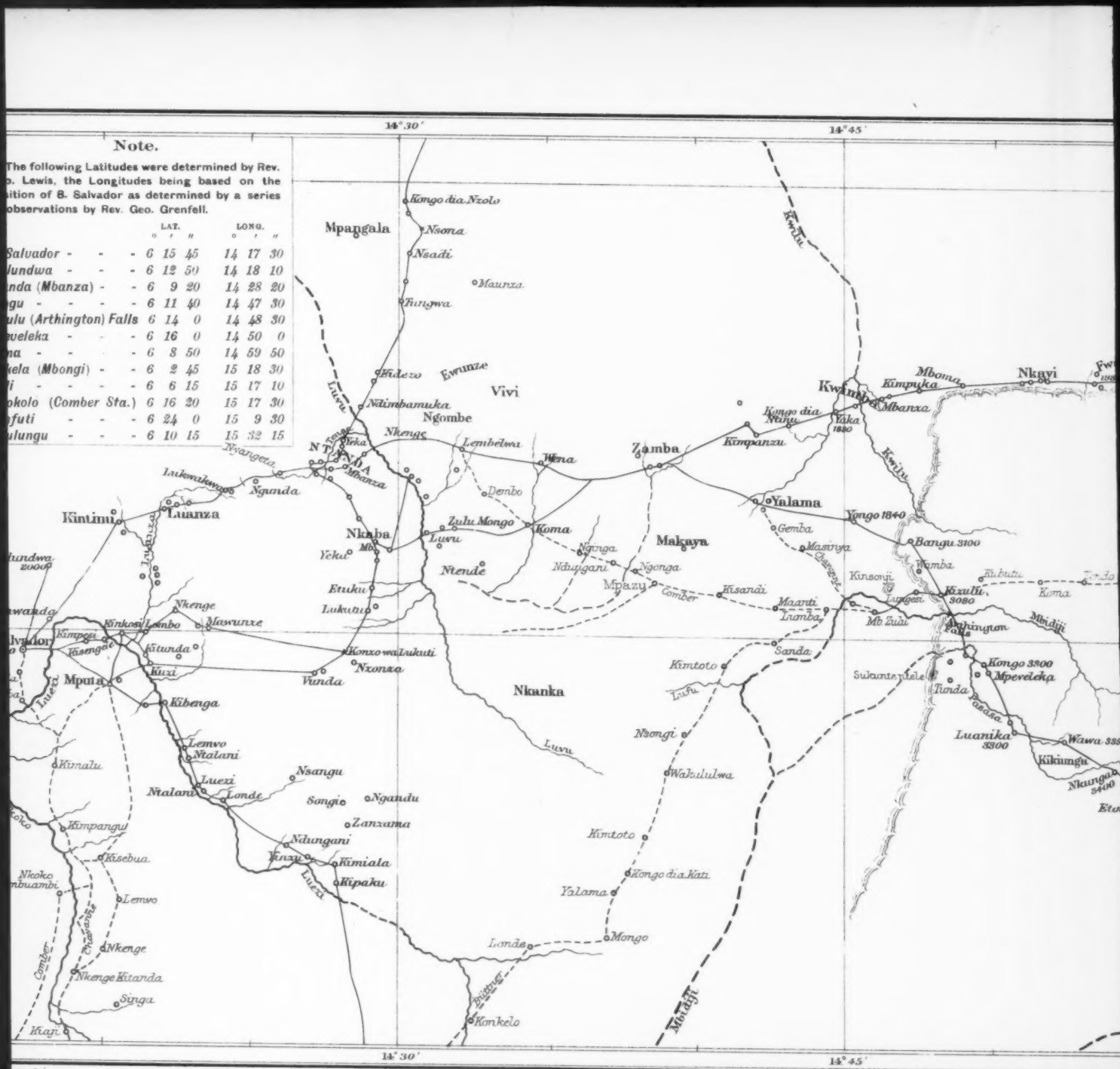
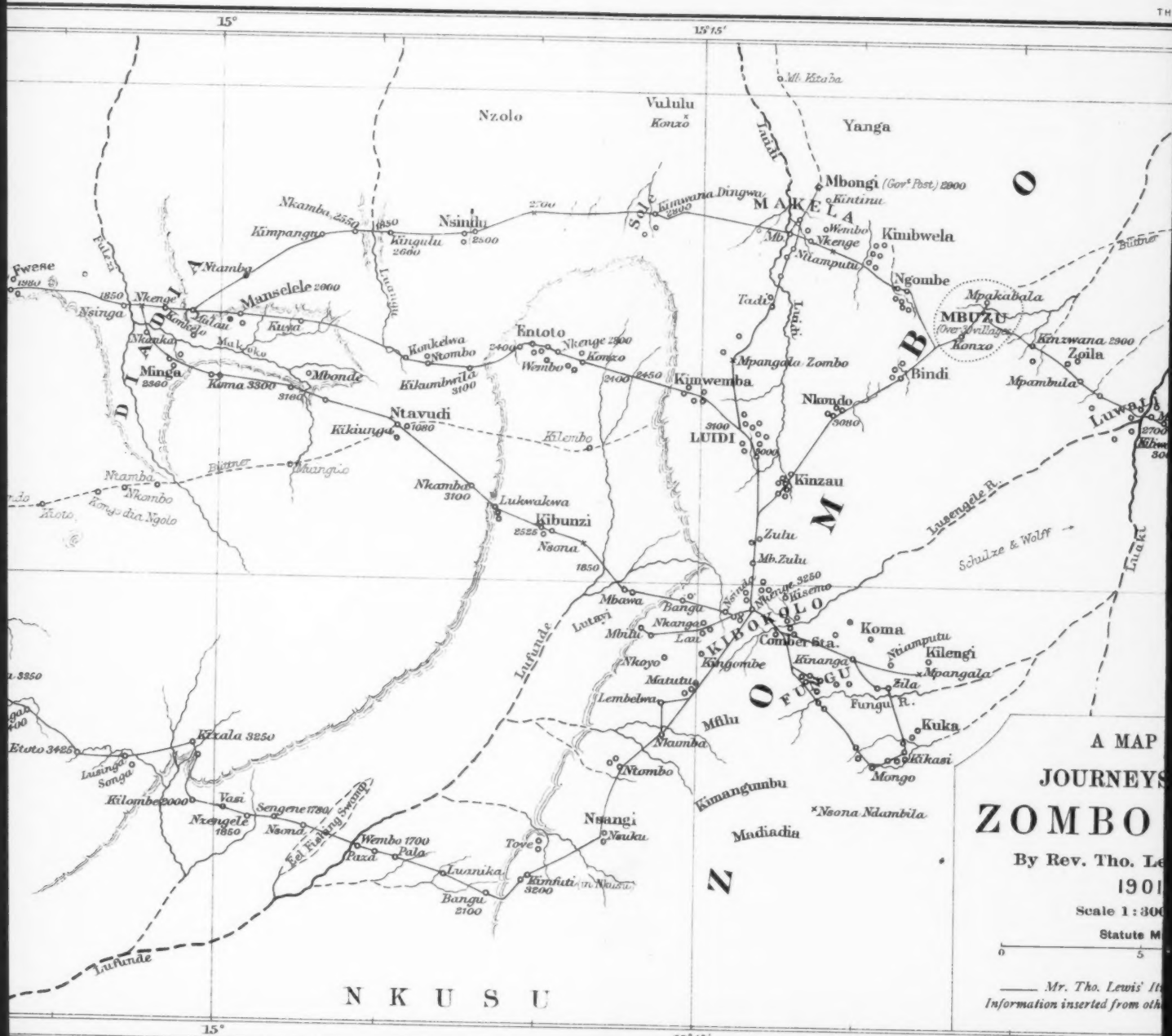
Nkenge
Kiaz
E. G. Ravenstein


14° 30′
14° 45′
Note.
The following Latitudes were determined by Rev. ɔ. Lewis, the Longitudes being based on the ition of S. Salvador as determined by a series observations by Rev. Geo. Grenfell.
LAT. LONG.
Salvador - - - 6 15 45 14 17 30
lundwa - - - 6 12 50 14 18 10
nda (Mbanza) - - 6 9 20 14 28 20
gu - - - - 6 11 40 14 47 30
ulu (Arthington) Falls 6 14 0 14 48 30
veleka - - - 6 16 0 14 50 0
na - - - - 6 8 50 14 59 50
kela (Mbongi) - - 6 2 45 15 18 30
i - - - - 6 6 15 15 17 10
okolo (Comber Sta.) 6 16 20 15 17 30
futi - - - 6 24 0 15 9 30
ulungu - - - 6 10 15 15 32 15
Mpangala
Kongo dia Nzolo
Nsona
Nsadi
Maunza
Fungwa
Ewunze
Vivi
Ngombe
Ndimbamuka
Nkenge
Lembelwa
Wena
Zamba
Kwamouth
Mbanza
Kimpanzu
Yalama
Yongo 1840
Gemba
Masinya
Bangu 3100
Wamba
Kinsonji
Kizulu 3080
Kuma
Mb Zuzi
Arthington Falls
Mbidji
Kongo 3300
Mpeveleka
Tunda
Luanika 3300
Wawa 335
Kikungu
Nkaunga 2400
Nkanka
Nsongi
Wakululwa
Kimtoto
Kongo dia Kati
Mongo
Londe
Konkelo
Kwilu
Luvu
Mbonza
Nkayi
Kimpika
Kongo dia Nzau
Yaka 1880
Nyangetz
Lukenakunga
Nganda
Kintinu
Luanza
Nkaba
Mb
Zulu Mongo
Koma
Luvu
Yeku
Ntende
Makaya
Ngonga
Ndungani
Mpazu
Comber
Kisandi
Maanti
Lumba
Etuku
Lukutu
Nkenge
Kinkosi
Lombo
Masunxe
Kimpesi
Kisenge
Kitunda
Kuzi
Konzo wa Lukuti
Nxonxa
Vunda
Mpuia
Kiberga
Lemwo
Ntalani
Kinalu
Luezi
Nsangu
Ntalani
Londe
Songio
Ngandu
Zanzama
Ndungani
Kimiala
Kipaku
Kimpangu
Kisebua
Nkoko
Lemwo
Nkenge
Nkenge Ntanda
Singa
Kiagi
Comber
Chiloango
Luezi
Kwilu
Mbidji
Sanda
Kimtoto
Luvu
Sukami Mele
Tunda
Yasada
Kongo dia Kati
Yalama
Mongo
Londe
Konkelo
Luezi
Mbidji



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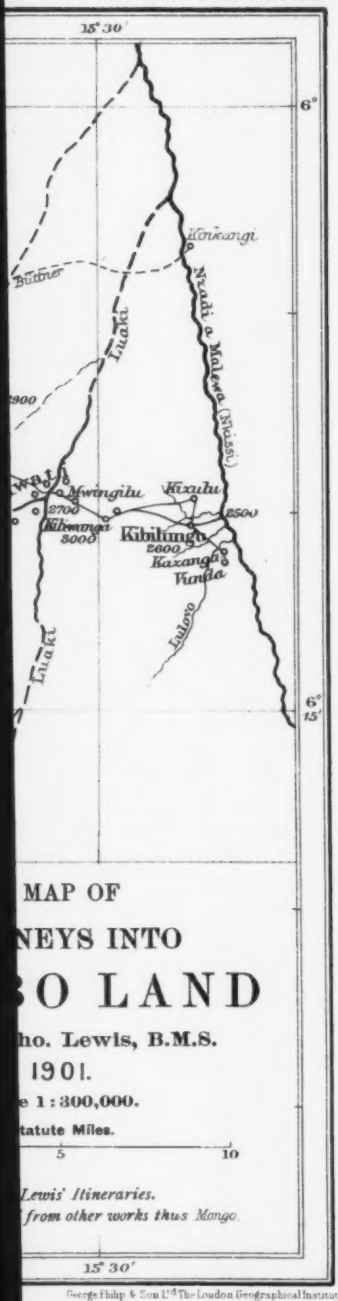

MAP OF

NEYS INTO

3O LAND

ho. Lewis, B.M.S.

1901.

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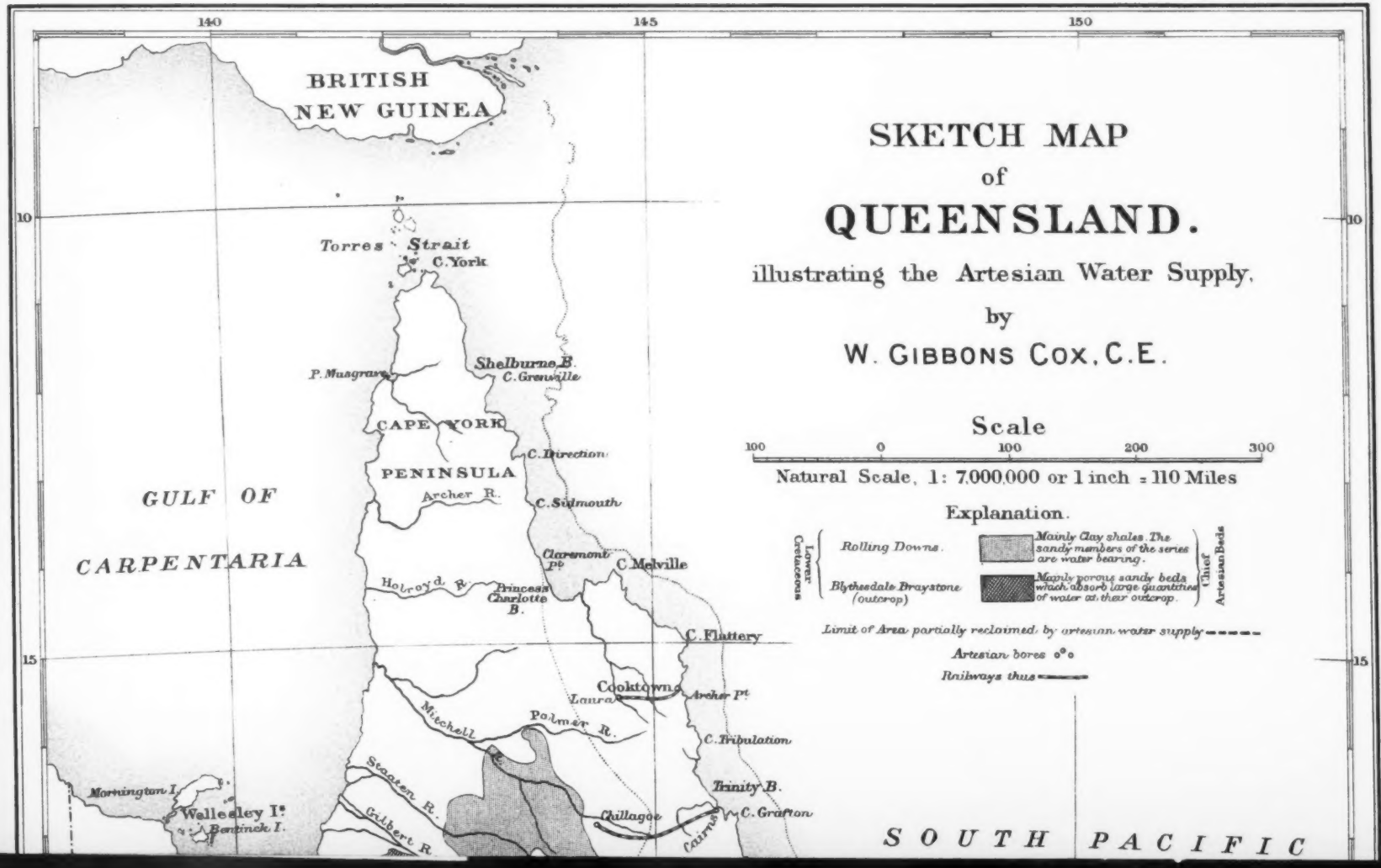
5 10

Lewis' Itineraries.

from other works thus Mango.

George Philip & Son L^d The London Geographical Institute



SKETCH MAP
of
QUEENSLAND.
illustrating the Artesian Water Supply.
by
W. GIBBONS COX, C.E.

Scale

100 0 100 200 300

Natural Scale, 1: 7,000,000 or 1 inch = 110 Miles

Explanation.

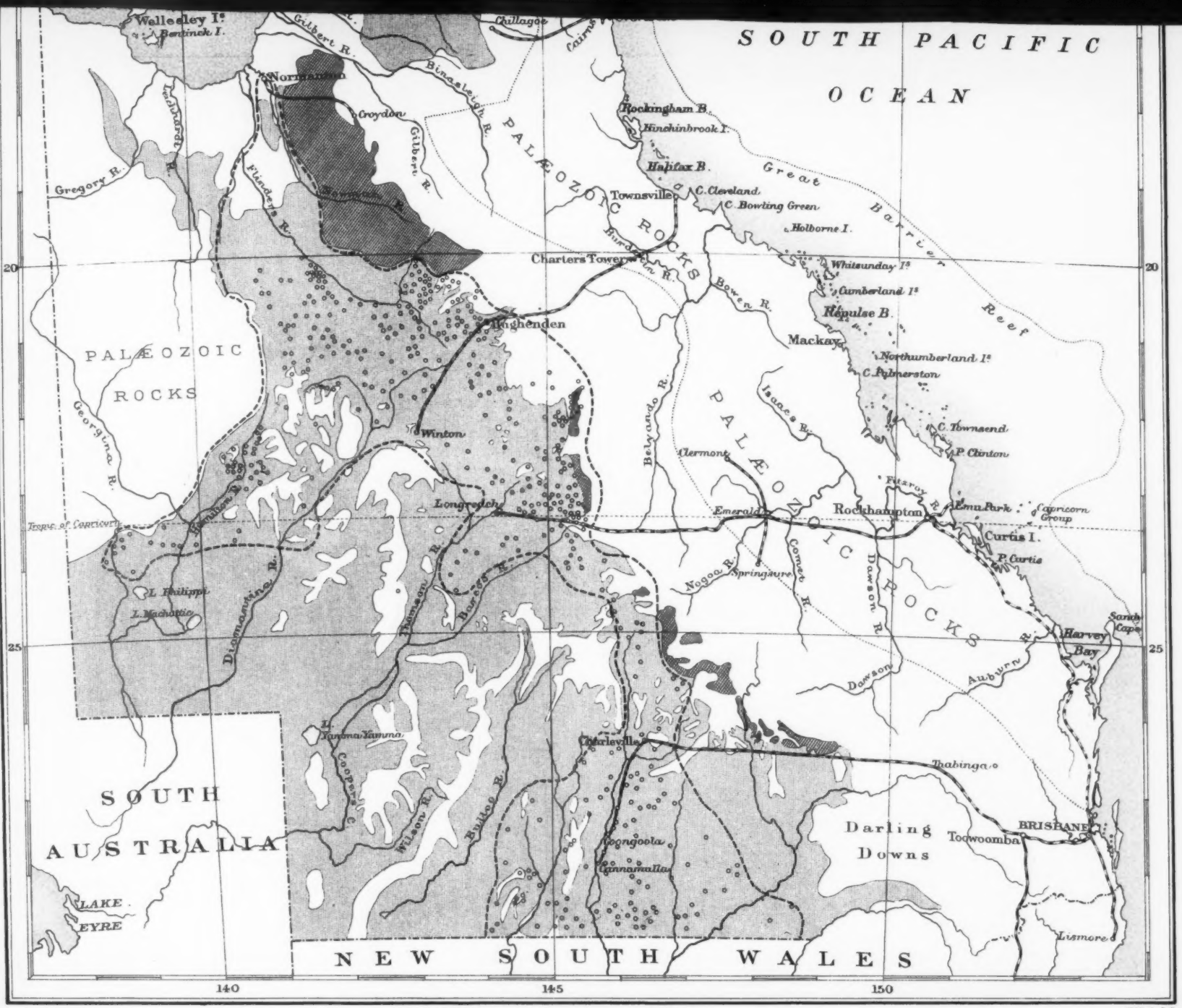
Lower Cretaceous — Chief Artesian Beds

- Rolling Downs. — Mainly Clay shales. The sandy members of the series are water bearing.
- Blythesdale Braystone (outcrop) — Mainly porous sandy beds which absorb large quantities of water at their outcrop.

Limit of Area partially reclaimed by artesian water supply ----

Artesian bores o°o

Railways thus ——



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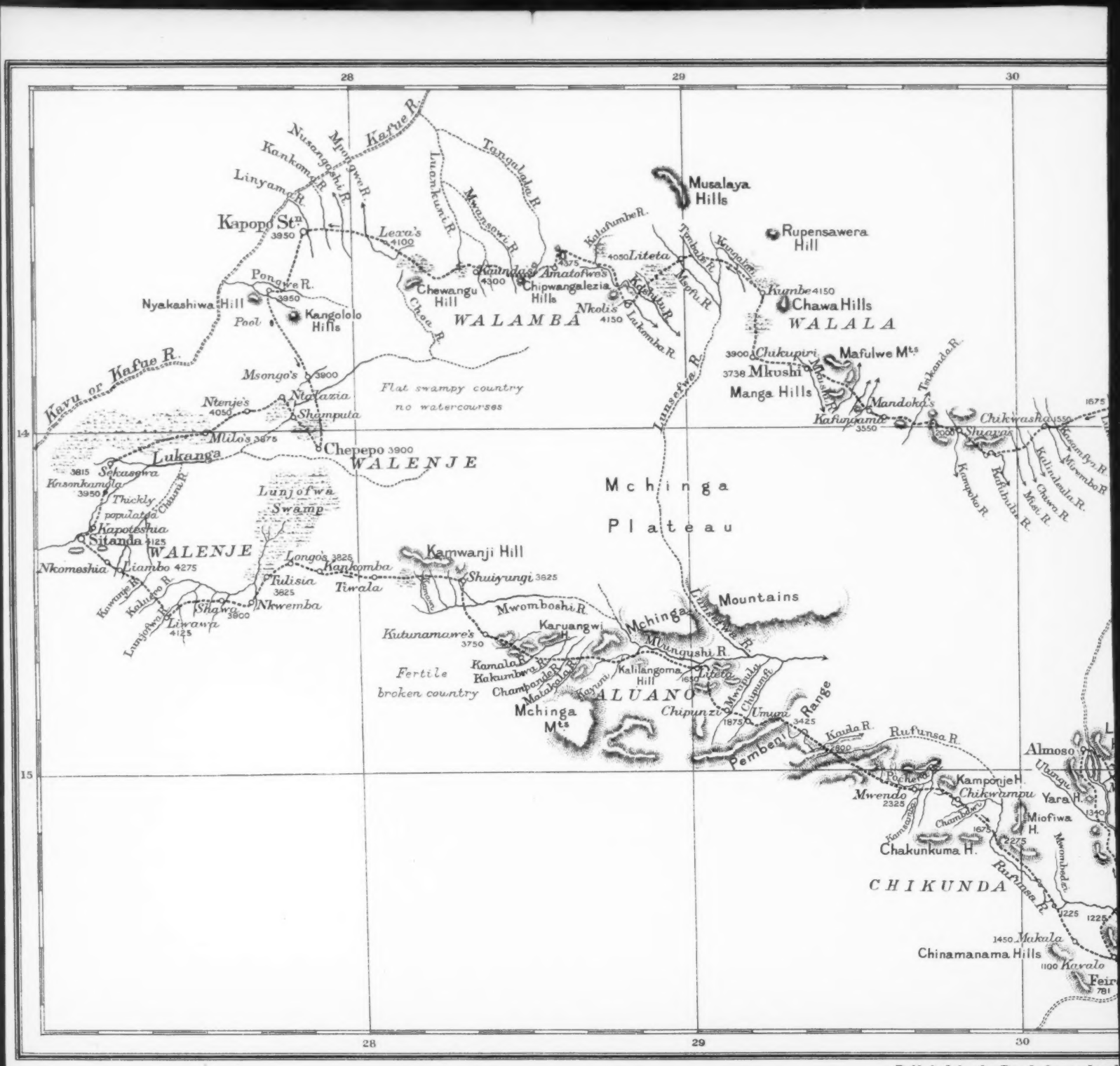
F. Neely, lith.


28
29
30
14
15
Kapopo St.n 3950
Musalaya Hills
Rupensawera Hill
Liteta 4050
Kapopo R.
Nusangoshi R.
Mpuigwe R.
Kafue R.
Kankomba R.
Linyama R.
Lexa's 4100
Luankuni R.
Mwansawi R.
Tangalala R.
Kalafumbe R.
Tembule R.
Kangolomi R.
Kalindaoi 4300
Amatofwe's 4575
Chipwangalezia Hills
Kafehulu R.
Msofu R.
Kumbe 4150
Chawa Hills
WALALA
Pongwe R.
Nyakashiwa Hill 3950
Pool
Kangololo Hills
Chewangu Hill
Chea R.
WALAMBA
Nkoli's 4150
Lukomba R.
Kafue or Kafue R.
Msongo's 3900
Ntelazia
Shampula
Ntenje's 4050
Flat swampy country
no watercourses
Lunsefwe R.
3900 Chikupiri
Mafulwe Mts
3738 Mkushi
Manga Hills
Mkushi R.
Tinkanda R.
Mandoka's
Kafungama 3550
Chikwasha 1550
Shiawa's 2088
Kasamfya R.
Mwembo R.
Kalindaula R.
Chawa R.
Mosi R.
Kampolo R.
Kafubula R.
Mulos 3875
Chepepo 3900
WALENJE
Lukanga
3815 Sekasowa
Knsonkamola 3950
Thickly populated
Chisuwa R.
Lunjofwa Swamp
Kapoteshua
Sitanda 4125
WALENJE
Nkomeshia
Liambo 4275
Longo's 3825
Kankomba
Tulisia 3825
Tiwala
Kawanje R.
Kaluzwe R.
Shawa 3800
Nkwemba
Lunjofwa R.
Liwawa 4125
Kamwanji Hill
Shuiyungi 3625
Mchinga Plateau
Mountains
Mwomboshi R.
Kutunamawe's 3750
Karuangwi
Mchinga
Mlungushi R.
Kamala R.
Kakumbwa R.
Kalilangoma Hill 1650
Liteta
Fertile broken country
Champonde R.
Matakalala R.
Kapuni
Mchinga Mts
Chipunzi
Mwenda
Chipumpe R.
Umuna
1875
3425
Pemberi Range
Kauda R.
Rufunsa R.
3800
Almoso
Ubungu
Kamponje H.
Chikwampu
Mwendo 2325
Yara H.
1340
Miofiwa H.
1675
2275
Chakunkuma H.
Kamwanga
Chambe R.
Mwambeda
Rufunsa R.
CHIKUNDA
1225
1450 Makala
Chinamanama Hills
1100 Kavalo
Feir
781
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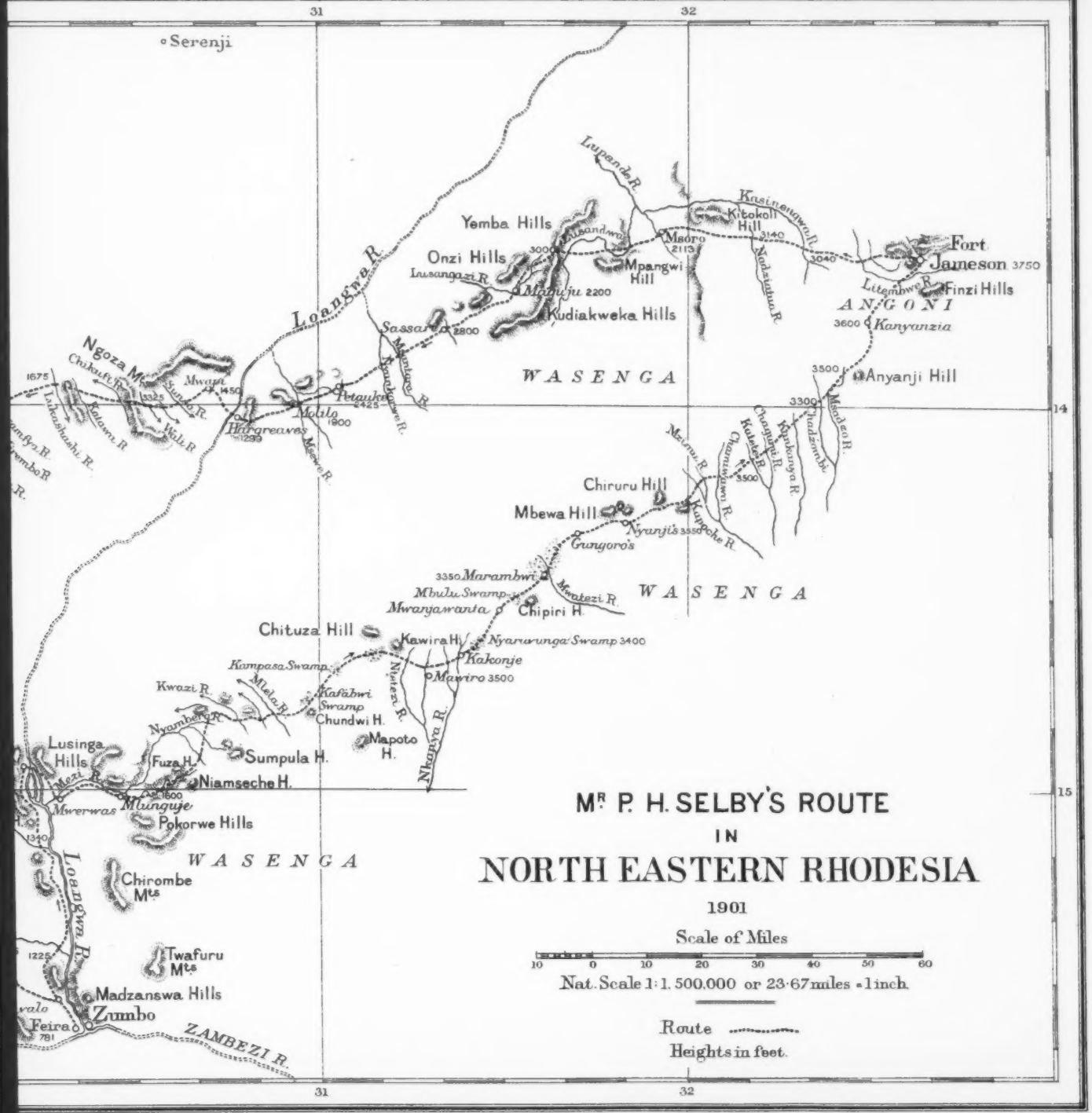

Mr P. H. SELBY'S ROUTE IN NORTH EASTERN RHODESIA

1901

Scale of Miles

10 0 10 20 30 40 50 60

Nat. Scale 1:1,500,000 or 23·67 miles = 1 inch.

Route .....

Heights in feet.

H. Manly, Lith.